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Medical and Surgical Report of Bellevue and Allied Hospitals ...

Bellevue Hospital

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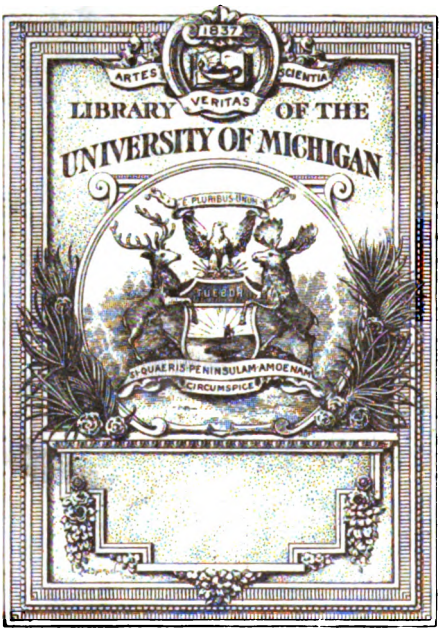

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MEDICAL AND SURGICAL

REPORT

OF

Bellevue and Allied Hospitals

IN

THE CITY OF NEW YORK.

VOLUME III.

1907-1908.

EDITED BY

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ORIGINAL COMMUNICATION.

OBSTETRIC TECHNIQUE AT BELLEVUE HOSPITAL.

By J. Clifton Edgar, M.D.,
Attending Obstetrician, Bellevue Hospital.

Emergency Patients Proper and Their Preparation for Confinement.

About fifty per cent. of the number of women delivered in Bellevue Hospital are either brought by ambulance or they walk into the hospital in active labor, and many of these are nearing the completion of the second stage when they are admitted.

Patients who at the time of their admission are in labor are at once taken to the bathroom, their street dress is removed, a soapsuds enema is given, a clean short gown is put on, and they are then taken to the delivery room. If time will allow before their delivery the pubes are shaved, the external genitals, buttocks, thighs and abdomen are scrubbed with warm water and tincture of green soap and washed with a 1 to 3,000 sublimate solution. They are then given two quarts of a 1 to 10,000 sublimate vaginal douche.

Patients Awaiting Confinement and Their Care During Pregnancy—The other fifty per cent. of cases cared for in this hospital apply for admission about six months before their expected confinement; they are called "waiting cases," and when their condition permits before their confinement they are occupied with the lighter housework about the wards. Women are not received earlier than the seventh month of gestation.

Cleansing on Admission.

These patients on being admitted first receive a full bath, the hair and scalp are washed with warm water and tincture of green soap and then a 1 to 10,000 sublimate solution. If the woman has a suspicious vaginal discharge, she is given a 1 to 10,000 sublimate vaginal douche, and this is given daily until she is con-

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fined or the discharge ceases. Laboratory examinations of vaginal discharges are not made as a routine.

The Examination and Management of Pregnancy—An antepartum examination is made and the patient's family and personal history taken, the latter including her age, nationality, occupation and her medical history. Date of last menstruation and quickening are asked. There is further elicited her history of previous pregnancies as to number, character and length of each, length and character of labor at term, history of previous puerperia as to fever present in, after pains, mastitis and number of days she remained in bed.

An external physical examination is made, including heart, lungs, breasts and nipples. The abdomen is examined, the uterine axis and elevation, and the amount of liquor amnii noted. The position on the abdomen of the fetal heart and its rate are also noted. The fetal head, dorsal plane and small parts are located. Presentation and position are determined. The pelvis is then measured, the diameters at the crest and the spines, the external conjugate and the right and left external obliques are found. Also the height of the fundus above the symphysis and the distance between the symphysis and the ensiform are measured. The circumference of the pelvis is then measured.

An internal examination is then made, the external genitals are inspected for varices, amount of secretion, inflammation, and the condition of the perineum. The vagina is inspected for rectocele or cystocele. The position and condition of cervix are then determined. The depth of the fetus in the pelvis and its presentation are then found. The internal measurements of the pelvis include the distance from the subpubic arch to the coccyx, and the flexibility of the latter, and the diagonal and estimated true conjugates. A record of the above is made and kept for reference at the time of the patient's delivery.

Urinalysis—If albumin or casts are found the patient is put to bed, is dieted, receives salines and is given other treatment that may be indicated, and the urine is examined every few days until it clears up or the patient is delivered.

Cathartics, Cleanliness, Vaginal Irrigation in Pregnancy—The first night of her admission to the hospital the patient receives a cathartic which is usually required. Either castor oil ℥iss, Epsom salts ℥ss, compound licorice powder ℥i, or two compound cathartic pills are given.

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From the time of the admission of the patient to the hospital until her confinement, she is obliged to have a full bath twice a week, her bowels are kept open by the use of the oil, salts, pills or licorice powder; if she has a suspicious vaginal discharge she is given daily a 1 to 10,000 sublimate douche, and she has only the regular diet of the hospital.

Diet During Pregnancy—The diet is general or mixed. Breakfast, which is served at seven o'clock, consists of fruit, cereal, eggs, bread and butter, and coffee or milk. Dinner at twelve o'clock consists of soup, meat, vegetables and dessert, with tea, coffee or milk. Supper, served at five o'clock, consists of cold meat, potatoes, tea or milk, and bread and butter.

Care of the Nipples—During the time before confinement the nipples are washed daily with a saturated solution of boric acid and alcohol 50 per cent.

The Management of Labor.

When the patient has her first labor pain she is prepared for delivery by a soapsuds enema, then a full bath and a clean short gown. She is then taken to the operating room and examined.

Asepsis of Nurses—Before making the examination the hands and arms to the elbows are scrubbed with hot water and tincture of green soap, the nails are cut and cleaned with an orange stick, and the hands and arms are again scrubbed with hot water and tincture of green soap. Chlorinated lime and a saturated solution of washing soda are then used and this is followed by rinsing the hands and arms in hot sterile water and then in a 1 per cent. solution of lysol. Sterile rubber gloves are then put on.

Vaginal Irrigation—If the patient has had a suspicious vaginal discharge she is given a 1 to 10,000 sublimate solution vaginal douche; if she has no discharge she is not given a douche. The patient is then examined, the position of the child is determined, the strength and frequency of the pains and the amount of dilatation of the cervix are found. If any abnormal condition is present the hospital interne reports to the attending physician on duty. If not, and the patient is only in the first stage, she is urged to walk around, resting at intervals, until there is full dilatation, at which time the interne is sent for. If the first stage is prolonged the only diet given is hot milk, of which eight ounces are given every three hours.

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Preparation of the Room—During this time the delivery room is being prepared. Sterile sheets are pinned on the table and four solutions are made and kept for use during the time of the patient's delivery: A 1-2,000 sublimate and a 1 per cent. solution of lysol for the hands of the obstetrician; and a 1-3,000 sublimate and a 0.5 per cent. solution of lysol for sponging the external genitals of the patient.

Asepsis of Internes—On the interne's arrival, he first puts on a rubber apron; the hands are sterilized by scrubbing them and the arms to the elbow for five minutes with hot water and tincture of green soap; the nails are cut and cleaned; the hands are then again scrubbed; the chlorinated lime and a saturated solution of washing soda are rubbed over the hands and arms; they are then rinsed in hot water and in a 1 per cent. solution of lysol. He then puts on a white sterile cotton gown over the rubber apron and rubber gloves which have been previously boiled.

Asepsis of Patient and Management of Labor—Before the delivery the nurse shaves the patient's pubes, scrubs the abdomen, thighs, buttocks and external genitals with hot water and tincture of green soap, and washes them with a 1-3,000 sublimate solution. A sterile short gown is then put on the patient and sterile white stockings reaching to the trunk are drawn on, and sterile towels are placed over the abdomen.

During the descent of the fetal head the patient's external genitals are sponged with sterile cotton wipes soaked in the sublimate and in the lysol solutions. The patient is usually delivered in the dorsal position, rarely in the lateral.

When the perineum is fully dilated the progress of the fetal head is manually regulated and diminution of expulsive forces is urged and the head delivered during the interval of pains.

Chloroform—Chloroform is used in most cases. If the shoulders do not follow the head in a few minutes, they are manually delivered by the finger in the posterior axilla.

Fundus uteri—As the body of the child descends the fundus is followed down by an assistant nurse, and after the birth it is held by her until after the placenta is born and the abdominal binder put on.

Cord—When the child has been delivered it is held by one of the nurses, and after pulsation in the cord has ceased or there has been good lung expansion, the interne ligates the cord. The

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Wharton's jelly is first stripped from it and then it is tied about two inches from the abdomen with No. 18, surgeon's braided silk, which has just previously been boiled. The child is then folded in a warm blanket and the interne and nurse turn their attention to the mother. The physician first removes his gloves and they are placed in the sublimate solution. The hands and arms are again sterilized and a fresh pair of gloves are put on before delivering the placenta.

The Third Stage—If the afterbirth has not been spontaneously delivered by this time, which is usually about fifteen minutes after the birth of the child, it is delivered by Crédé's method. It is expressed into a white enamelled pan which is used for that purpose only, and which has been washed in a 1-20 carbolic acid solution and covered with a sterile towel. This is held by the nurse under the patient's vulva and the placenta caught. If the membranes do not follow the placenta they are gently opened fan-shaped.

Perineum and Cervix—After the placenta and membranes have been delivered, they are examined for completeness. The perineum is then inspected, and if it has been lacerated, is immediately repaired. There is no vaginal examination made after labor unless there is reason to believe the cervix is seriously torn. If it is, it also is repaired at this time.

Ergot—Immediately after the third stage the patient is given ʒi. of the fluid extract of ergot diluted in about one-fourth glass of water.

Vaginal Irrigation—The interne gives the patient two quarts of a 1-10,000 sublimate solution vaginal douche. The external genitals, thighs and buttocks are then washed with a 1-3,000 sublimate solution.

Vulval Dressing—A wet sublimate, 1-20,000 dressing, is applied to the vulva and this is covered with an oakum pad.

Binder—An abdominal binder is then applied; this is made of unbleached muslin, reaching from just under the breasts to a few inches below the trochanters. It is pinned down; the front and gores are pinned in on each side. The vulva pad is then pinned to the lower part of the abdominal binder, both in front and back. If the uterus is large and flabby, a folded towel is placed over the fundus before the binder is pinned on. The gown and stockings are then removed and a short clean gown put on. Before removing the patient from the table the tem-

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perature is taken and the pulse and respiration counted. The patient is then placed on a carriage and wheeled to her bed in the lying-in ward.

After the mother has been placed in bed the child is weighed, measured, and the eyes are cleaned, and the cord dressed for the first time. The placenta is then weighed and measured and any abnormalities noted, the site of rupture in the membranes is found, the length of the cord is measured and any peculiarities noted.

Care of the Newly-born Child.

As soon as the head of the child is born the nurse cleans its mouth by placing a piece of sterile gauze, which has been soaked in a boric acid solution, on her finger and sweeps it around the mouth and pharynx.

Eyes—The eyes are then wiped out with boric acid gauze. After the birth of the rest of the body and after the cord has been tied, the child is rubbed with olive oil and placed in a warm blanket until after the mother has been put to bed. Then a drop of 1 per cent. solution of silver nitrate is instilled into each eye and this is followed by an irrigation with a solution of boric acid.

Anomalies—The child is examined by the physician for any abnormal condition and then it is weighed and measured.

Measurements—The measurements taken are its total length from the vertex to the coccyx. The diameters measured are occipito-mental, occipito-frontal, sub-occipito-bregmatic, fronto-mental, trachelo-bregmatic, bi-parietal, bi-mastoid, bis-acromial and the bis-trochanters. The circumferences measured are the occipito-mental, sub-occipito-bregmatic, bis-acromial and the bis-trochanteric.

Cord—The cord is then dressed by washing it with a 1-5,000 sublimate solution and a sterile gauze compress put on, and the binder placed over this. Little pads of boric acid gauze are placed on each eye. The rectal temperature is taken, the child is then again placed in a warmed blanket and put in its crib.

Bath—A full tub bath is not given the child until after the cord has separated.

Dress—The dress consists of shirt, diaper, barrow-coat, and an outer dress. The clothes are all sewed on, no pins are used except in the diaper.

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First Nursing—It is then put to the mother's breast, it now being about six hours old.

MANAGEMENT OF THE PUERPERIUM—THE MOTHER.

Fundus—After the mother has been placed in bed she is visited every hour by the nurse and the condition of the fundus noted.

Temperature, Pulse, Respiration—For the first twenty-four hours after delivery the temperature is taken and the pulse and respiration are counted every four hours. After this they are taken every six hours until the woman is out of bed, and three times a day until she is discharged.

Vulva Dressing—The vulva pads are changed every four hours for the first twenty-four hours and after this they are changed every six hours until the discharge ceases. When the pads are changed the nurse first scrubs her hands with hot water and tincture of green soap for five minutes and then rinses them in a 1-2,000 sublimate solution. The patient's external genitals are washed with sterile cotton and a 1-3,000 sublimate solution, and after the first twenty-four hours a dry dressing is applied, instead of the wet sublimate, and covered with an oakum pad. After each urination or defecation the external genitals are washed with the sublimate solution, 1-3,000, and clean pads are applied.

House Staff Rounds—The height of the fundus above the symphysis is measured just after labor, and this is done once a day thereafter until it sinks below the symphyses.

The patient is seen twice daily by the house physician; the pulse, temperature, quantity, odor and character of the lochia, the condition of the uterus, the bowels, the bladder, the breasts and the nipples are noted.

Diet—The diet of the first twenty-four hours consists of milk alone, which the patient is obliged to take hot. About three hours after being put to bed, unless the patient is asleep, she is given eight ounces of the milk, and this amount is given regularly every three hours, she getting, in all, about two quarts the first day. On the second day milk alone is given, and with the same regularity and in the same quantity, but the patient may take it hot or cold. On the third day crackers and broth or soup are added to the same quantity of milk as given on the other two days. On

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the fourth day light meats, such as mutton, lamb or veal chops and toasted bread and tea or coffee are given. From this day on the diet is increased, if the patient's condition is normal, until she gets the same food as before confinement. In addition to the regular meals on and after the fourth day the patient is given eight ounces of milk, either hot or cold, three times a day, at 10 a. m., 3 p. m., and at 8 p. m.

Bowels—At 9 p. m. on the third night after confinement the patient is given two compound cathartic pills. At 5 o'clock the following morning she is given a half-ounce of Epsom salts. If the bowels have not been thoroughly opened by 9 a. m., she is given a soapsuds enema. After this her bowels are kept open daily, if necessary, by one of the above cathartics or the enema until she is discharged.

Urinalysis—The urine is examined the first day after labor, and if it is found normal it is not again examined. If it is abnormal the patient is given any treatment that is indicated and the urine is examined daily until she is discharged, or the urine becomes normal.

Bladder—If the patient has not urinated within eight hours after labor she is urged to do so. If she has difficulty, hot water is poured into the bed pan, hot compresses are placed over the pubes, and if urination is not then accomplished she is catheterized, and this is done every eight or ten hours thereafter if necessary.

Nipples—The nipples are washed with sterile gauze soaked in a saturated solution of boric acid before and after each feeding of the infant. If the nipples are cracked they are painted with compound tincture of benzoin, or touched with a silver nitrate stick. If the breasts are very hard and painful they are massaged.

Posture in Bed—For the first twenty-four hours the patient is kept perfectly quiet in the dorsal position, and she is not allowed to turn on her side until the second day. On the first day she is not allowed to see her relatives or friends, but she may receive them on and after the second day. If her condition has been normal the woman may on and after the sixth day sit up in the bed for a few hours each day.

Leaving Bed—The time at which she is allowed to leave the bed depends entirely on the quantity and character of the lochia and on the involution of the uterus. While the lochia is san-

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guinous or sub-sanguinous, or if the fundus is above the symphysis the woman is kept in bed. If the lochia is serous or absent and the fundus is below the symphysis on the ninth day she is allowed to get up and sit in a chair for a few hours, and on the tenth day she is allowed to walk around the hospital ward.

Discharge—On the twelfth or thirteenth day she is discharged.

Examination Before Discharge—Before being discharged, the woman has a physical examination made by the hospital physician. The condition of the breasts, nipples, and of the perineum is noted. The position and condition of the cervix and the condition of the os are determined, and also the position, sensibility and mobility of the uterus and the condition of the parametrium are found.

Management of the Puerperium—The Child.

Temperature—The rectal temperature of the baby is taken, and its respirations and pulse are counted once a day, unless it is indicated oftener. This is done just before giving the bath.

Bath—The child is given a bath every day. Until the cord has separated the bath is a sponge bath given on the nurse's lap. The binder is not removed and the cord is not allowed to become wet. After the cord has separated the binder is taken off and the bath is then given in a tub. The temperature of the water is about 98° F. A new wash cloth is provided for every child and white castile soap is used. The buttocks, external genitals, axilla and neck are dusted with talcum powder.

Cord—After the cord has separated, a sterile gauze pad is put over the umbilicus and the binder kept on until the child leaves the hospital.

Eyes—The eyes are washed with a saturated solution of boric acid, applied with an eye-dropper, and wiped out with sterile gauze, once a day just after the bath, unless indicated oftener.

Ophthalmia Neonatorum—If ophthalmia develops the child is at once isolated in a darkened room and it has a special nurse. Cold compresses are applied to the eyes; they are irrigated with a saturated solution of boric acid as often as necessary to keep them clean, and one drop of a solution of argyrol is put into each eye several times a day, followed by washing with the boric acid solution. If called for other treatment is prescribed by an oculist.

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Diapers—The napkins are changed every four hours or oftener if necessary, the buttocks and genitals are dusted with talcum powder, and after each stool the buttocks are washed.

Nursing—The baby is first put to the breast six hours after its birth, and then every two hours during the day and twice during the night, at 1 a. m. and 5 a. m. It is allowed to nurse ten or fifteen minutes at each feeding. If the mother has an insufficient quantity of milk, or for any reason cannot nurse her child, it is nursed by one of the other healthy women who are in the hospital, and nursing infants at the time. If the child is syphilitic or has any contagious or infectious disease, it is given two ounces every two hours of modified cow's milk from a nursing bottle.

Mouth—The mouth is washed before and after each nursing with sterile gauze soaked in a saturated solution of boric acid.

Weight—The child is weighed once a day when it has been undressed for its bath.

Examination on Discharge—A physician's examination is made by the hospital physician on the day the child leaves the hospital. The heart and lungs are examined, the condition of the umbilicus, eyes, mouth, skin, bowels and bladder are noted.

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ORIGINAL COMMUNICATION.

OBSERVATIONS ON THE CONSERVATIVE OPERATIVE TREATMENT OF THE UTERUS AND APPENDAGES.

By R. H. Wylie, M.D.,

Visiting Gynecologist, Bellevue Hospital.

This paper, as its title indicates, is not intended to be statistical or exhaustive. Twenty-one years ago, when I had finished my term as house surgeon at Bellevue Hospital and became acquainted with gynecology, there was little conservative work done on the uterus and its appendages. Colpotomy posterior or anterior and incision parallel to Poupart's ligament for abscess after it had practically pointed, constituted, I believe, practically the only conservative operations in fashion at that time. Since then operative treatment has had many waves of fashion.

At the outset I would say that there ought to be made a distinction between operations that are strictly conservative and those that are both conservative and preservative. For example, the operations spoken of above were originally only conservative, in that the operator hoped to remove the jeopardy to his patient's life and dared not attempt to remove a pus tube in which the abscess was often located; whereas, nowadays when we open the belly it is undoubtedly far safer and easier to remove the ovary and the tube entirely on one or both sides than to carefully and often laboriously remove only the diseased portions and preserve portions of the organs so that their functions may still be performed.

In those pioneer days once the belly was opened the operators justified radical removal of the tubes and ovaries really healthy, by calling the ovaries "cystic" or the tubes "catarrhal," or perhaps sought justification in unsexing the woman on account of supposed reflex disturbances of the nervous system. Again, we note at this time the conservative operation of removing the

Read before The Society of Alumni of Bellevue Hospital, June 5, 1907.

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ovaries, in the hope that it would stop the growth of fibroids by producing the artificial menopause. This process was a good example of the conservative in contradistinction to a preservative process, by which we leave the appendages and the uterus and simply remove the fibroids. Curiously enough in those olden days conservative operations were done owing to faulty technique. For example, in the old, foolish method of tying off the appendages by the Staffordshire or Tait knot, or by thrusting a double ligature through some part of the broad ligament and then after carefully crossing the ligature tying first on one side and then on the other, made it practically impossible in many cases to remove all of the ovary and tube. Of course, every operator was hoping to find a long pedicle, or a lax broad ligament, so that he could bunch it up, and make a pedicle to suit this anatomy, ignorant method of ligature. It is wonderful how inefficient this ligature was in preventing hemorrhage during the operation, making inoperable, cases that are now considered easy, and also how it favored hemorrhage if the patient vomited or coughed afterward. In easy cases, even, when carelessly applied, a portion of the ovary could easily be left in or below the stump, and in badly diseased and adherent cases associated with thickening and changed condition of the ovary and surrounding tissues, it was impossible to be sure whether one had removed all of the ovary or not.

Thus we found a certain number of cases that had supposedly had both ovaries and tubes removed still menstruating regularly. This gave rise to the belief that a woman might menstruate even though both appendages were completely removed, and to the belief that occasionally more than two ovaries existed.

Never have I seen one case of true menstruation after complete removal of both ovaries, though, of course, I have seen a number of cases where there were several recurrent bloody discharges which might be termed pseudo-menstruations, but where a method of ligature based on simple anatomical knowledge is adopted, I have not seen these pseudo-menstruations. This method is the simple one of using the round ligament as the guide for placing the ligature. I tie the ovarian artery well off to the side of the pelvis, passing the ligature above the round ligament through that portion of the broad ligament which has no blood vessels or other structures in it; in fact, where it is only two layers of peritoneum. This ligature includes, then, only the ovarian

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artery, veins and nerves, and hence the blood vessels are securely tied with ease.

I tie the uterine anatomosis with the ovarian by passing the ligature below the round and ovarian ligaments, and, of course, close to the uterine cornua; in simple cases this ligature also includes the uterine end of the tube, but where the tube or cornua are much diseased I first cut through the tube so that it is not included and then excise the uterine end of the tube, sewing up accurately the trench left after the excision. I adopted this method many years before I had seen or read of its being done, but I dare say it was done often before I did it. I believe it to be the ideal one to prevent hemorrhage, and permits of complete excision of the appendages. Some of you will remember when the question of menstruation after complete removal of both appendages was a much discussed one; that Johnstone, of Kentucky, I think it was, wrote an interesting article advancing the idea that a certain ganglion between the ovary and uterus had to be removed to stop menstruation.

Whether that is true or not I know not, but if it be true, then that ganglion is removed when the ovaries are completely removed. I have dwelt upon this aspect of the subject unduly, apparently, because these conservative mistakes, so to speak, of operators who meant to be radical, taught something. They taught us that women could have the tubes and ovaries removed for the most part, and yet they could menstruate and have a practically normal sexual life, and be free from pain in some instances.

On the other hand, we know that many of these cases suffered as much or more than before the operation. Quite properly this taught us to be more conservative and preservative in some cases and more radical in others.

For example, it was the fashion to advocate complete removal of the entire uterus and its appendages because of bad after results from unsuccessful efforts at complete removal, and from the effects of partial removal, of the appendages, and because it was found that the mortality of complete removal was not great.

Have we arrived at a final method of procedure in each particular case? I believe not, though our technique has been much improved and the prognosis as to life or death is much more definite, but there is still a great difference of opinion as to what procedure to use in similar cases.

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I shall first consider the vaginal route for conservative and preservative operations.

Where there is a pelvic abscess which is not confined to the tubes or ovaries, then I try to drain it by vagina.

In abscess due to an acute septic process after a miscarriage, abortion or after parturition or due to traumatism or after extra-uterine pregnancy; in other words, where there are no great structural change in the tubes due to destructive disease, I have seen radical cures obtained by simple incision and drainage, but these cases are rare. I have seen one case, many years ago, of a pelvic abscess in acute sepsis after the birth of a child, in which a large amount (perhaps a pint or more) of pus was evacuated by a trocar thrust into the vault of the vagina and a portion of the canula left in to drain, and the patient recovered completely and afterward bore a child, though she had a temperature of 105° F. and such a bad general condition that no anaesthetic was used.

In this case, and in other cases where we cut through the vault of the vagina owing to bad general condition, it is done to take away immediate jeopardy to the patient's life, and it ought to be done, but it usually is only a preparatory operation to a future abdominal section. Of course a good number of these cases will get so much better temporarily that they will put off the abdominal section until one or more attacks force them to submit to the procedure; that in most cases affords the only hope of positive cure. I have performed colpotomy for hydrosalpinx, especially among the *demi-monde* before the days when appendectomy became fashionable, because they were afraid to have anyone suspect, owing to an abdominal scar, that they had lost their ovaries. It is true that these cases could get along without an abdominal section if they were willing to endure recurrent attacks of varying degrees of severity. After several visits to France, where the vaginal route was so fashionable and because some patients were so sensitive about having an abdominal incision, I tried the vaginal route in a very few cases of salpingitis and simple ovarian cysts. Appendectomy rapidly became so fashionable, however, that an abdominal scar was no longer a stigma, but an honorable scar.

I appreciate the fact that the vaginal route may be taken for conservative operations, and may be skillfully performed by some men, but the advantages of the abdominal route are simply overwhelming. I believe the vaginal route was begun because the

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technique of asepsis of hands, instruments, sponges, etc., had not been sufficiently perfected by some men, and hence their mortality was less by the vaginal route, as there was ordinarily less exposure by this route of the peritoneal cavity and its contents. The vulva and vagina will always be more difficult to render aseptic than the abdominal wall.

Drainage, even by the vagina, is done rarely, so this advantage is taken away. Mechanically the abdominal route is far superior. By vagina one must cause a traumatism of more or less severity to bring into view the uterus, or the appendages, and at the moment the fingers are working in the vagina to break up adhesion you cannot see the parts; if you get hemorrhage, or the appendix is involved, you probably are forced to do an abdominal section. For artistic, refined work, such as breaking up adhesions in the lines of cleavage of the peritoneum while doing the least possible structural injury to the parts, and restoring the parts so as to get the least adhesions or mal-positions, the abdominal route is far the better route.

Then, of course, the abdominal route is practicable in all cases; while the cases where the vaginal route is practicable are few.

For exploration of the abdominal cavity for other complicating trouble the abdominal route has the added advantage.

I do not presume that I have settled the difficult questions as to how much of the genital organs we ought to preserve, or even whether any portion of them in all cases. Indeed, the main object of this paper is to bring out a discussion on a few points only.

In every case as complete a diagnosis as possible should be made before the operation, so that the prognosis can be thoroughly discussed with the patient and relatives, because every surgeon must be influenced by the desires of the patient, especially where it is not a matter of life and death. The psychological, sexual and social aspects as well as the physical effects of the operation must be considered carefully. One patient desires to be relieved of any chance of further operation, another wishes to take any chance in her desire to become a mother—in fact, submits to the operation only for that reason.

The effects, real or fancied, by the patient or husband, occasionally have serious results on the patient's future happiness, but full consideration of these questions are beyond

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the scope of this paper. The proximity of the menopause is an important consideration.

As a preliminary measure I usually divulse the uterus and clean out the cavity as well as possible, thus getting rid of polypi or easily attacked intra-uterine fibroids, or retained placenta or membranes and to remove diseased mucous membranes, as the case may be.

This procedure is good also in that the divulsion permits freer draining from the cavity of the uterus in case it is left in, or from the cervix in case it is left.

Fibromata give few or no symptoms except when they involve the mucous membrane or are incarcerated in the pelvis or are beginning to be degenerated or have become very large, so that the patient's attention is not drawn to them very often on account of the mere presence of the fibromata. Hence, I do not get a chance to do much conservative work on them. I am always hoping to find cases in which I can leave the uterus intact by an elliptical excision of the base of pediculated fibroids, the incision of the overlying tissues of intramural, or even intrauterine fibroids, and then by the buried suture stop hemorrhage and take up dead spaces, and finally neatly sew over the peritoneal edges. Some of the Parisian operators gave me increased courage to attempt cases that I previously subjected to hysterectomy.

After all, on account of complicating salpingitis or the multiplicity or situation of the tumors or the desire of the patient to be saved further operation, I have done very few simple myomectomies except where malignant disease is suspected; my practice is removal of both tubes and ovaries, and amputation at or just below the internal os. If the woman is young I am inclined to leave an ovary.

If the right ovary can be preserved as easily as the left I prefer to leave it, as it is less liable to interfere with the rectum or be itself disturbed by the rectum.

In cases of extra uterine pregnancy or new growths that have no tendency to recur, such as simple cysts of the ovary or broad ligament or parovarian cysts, I try to remove the growth and leave the ovary and tube intact as far as possible; however, if the other tube and ovary is in good condition I deem it better to remove the diseased side completely if the conservative operation is very difficult and offers only a hope

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of the parts functionating properly owing to mutilation or distortion. It is these cases in which we do not have disease of an inflammatory character which has proceeded from the uterus, through the tubes, that we get brilliant results.

It is in the cases of salpingitis and ovaritis in which destructive structural changes have occurred, not only in the mucous membrane of the tube but in its deeper structures, that we nearly always fail of permanent benefit by conservative work. In other words, we too often find the tubes diseased beyond repair at the time of operations on one side, and even if the other side is apparently not affected to the naked eye the microscope would reveal already an inflammatory process.

Then, too, often the inflammatory process which has spread from the uterus to one side is not controlled, and gradually passes to the other side from the uterus.

It is in the cases of inflammatory disease that I have hoped that the pathologists or bacteriologists would help us to decide how much or how little to preserve, but so far they have disappointed us.

In cases where they clinically present marked differences in their power to destroy not only the structure of the tube but the walls of the intestines, the pathologists often simply send a report that it is inflammatory disease, without any distinction as to its character or origin.

For example, I have frequently observed tubes filled with pus with a prolonged history and yet the inflammatory process practically confined to the tubes, and no very marked changes in the walls of the tubes except a general thickening.

In other cases, with no prolonged history, I find cases with little or no pus, and adherent only at one or more points to small spots on the intestine, and yet the wall of the tube and the intestine is destroyed.

Again, we find a node at or near the cornua, in which the thickening of the wall of the tube forms a hard tumor with little apparent change elsewhere.

My practice in these inflammatory cases is to dilate and clean out as well as possible the uterus, and if I drain the uterus, using a hand rubber tube, then open the belly, break up the adhesions with great care not to injure the tubes mechanically; using great care not to pinch them with forceps

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but handle them with the finger and use forceps on the round ligaments or portion of the broad ligament or, if necessary, the fundus of the uterus. It is especially desirable to use forceps that will encompass the tube and not squeeze it, but grasp and fix a portion of the broad ligament during all manipulations. A sound or probe is not good to decide whether the tube is patulous or not, as you may injure the tube with it even if handled delicately on account of the convolutions and from the fact that the probe must be very small (and hence dangerous) to enter the uterine end of the tube. I use normal salt solution injected gently by means of a simple syringe.

I have used a very weak antiseptic solution, but with the idea only that I might wash out and render less septic the contents of the tube, but not with the hope of really curing a diseased tube.

When both tubes are diseased I occasionally choose the one less diseased at the uterine end and leave a portion of it, in which case I try to approximate the peritoneum, covering the tube to the mucous membrane lining in an endeavor to keep the tube patulous by means of the smallest possible needle and catgut.

I expect little as far as child-bearing from this procedure, except to give the child-loving woman a faint hope of motherhood.

Where there is no hope of doing good by leaving a tube or part of a tube, I frequently leave one ovary to preserve the menstrual function, and I take great pains to preserve its nerve and blood supply.

If this precaution is not used, the ovary becomes covered with permanent dense adhesions, and you get the sufferings caused by the congestion and swelling of the corpus luteum, and degeneration of the ovary causes imperfect and irregular menstruations.

I fear this mistake of not preserving the blood supply of the ovary left after salpingectomy is not infrequent, as I have had to operate for several in the past year on account of the suffering and found the normal blood supply gone and the degenerated ovary has to be literally gouged out. In cases complicated by retroversion I always shorten the round ligament after Dr. W. Gill Wylie's method. Even where I re-

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move both appendages completely I frequently leave the uterus, unless there be some special reason, such as suspected malignancy, fibroids or marked enlargement due to fibrosis. On the other hand, I have left an ovary in a goodly number of cases where hysterectomy was done. I believe that ordinarily the uterus gives no trouble when the appendages have been completely removed after a preliminary curetting. When I do hysterectomy in these cases I prefer amputation about the internal os, and I take care to sew the ends of the sound ligaments into the sides of the stumps of the cervix. I prefer this operation even in cases when I drain, as it is easy to drain through the posterior fornix of the vagina.

The reasons for leaving the uterus or cervix are that it shortens the time of the operation and preserves a better copulating canal, and of course there is less danger of injuring the ureters and interfering with the functions of the bladder. When we do hysterectomy I am not yet convinced that it is well to leave the ovaries. —I know that they occasionally give trouble, and I have not yet proven that they do any real good—the effect of the menopause is so variable under apparently the same physical conditions. The so-called reflex and other nervous symptoms are so various under the varied social and sexual conditions that I have not yet come to a definite conclusion. It surely is easier and takes less time to completely remove the ovaries and tubes than to leave them in doing a hysterectomy. Whether an ovary left in these cases will alleviate or postpone some of the disagreeable troubles of the menopause, time and a large number of cases will tell.

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THE BACTERIOLOGY OF THE BLOOD IN TYPHOID FEVER—AN ANALYSIS OF 1,602 CASES.*

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During the last six years we have made bacteriological examinations of the blood in 123 cases of typhoid fever in the wards of the Second Medical Division of Bellevue Hospital. In 1904 we published an analysis of 604 cases of typhoid fever (for the most part collected from the literature) in which the blood had been examined bacteriologically. Seventy-five per cent. of these cases, examined at all stages of the disease, showed the presence of the typhoid bacillus. Bacteriological examinations of the blood of typhoid and suspected cases have been made routine practice in many hospitals, and the number of cases reported to date, including our own, reaches a total of 1,602. The present analysis includes all the cases in our former paper, except the reports of individual cases.

Methods—We usually draw 10 c.c. of blood into an all-glass syringe from a vein at the bend of the elbow. In our earlier experiments (1901 to 1903) we used broth flasks, putting 2 to 3 c.c. of blood into each 100 c.c. of broth. Later, on learning that Busquet and other French authors had had extraordinary success by using very large quantities of broth, we followed their method of diluting each cubic centimeter of blood in about 200 c.c. of broth, but the results were not appreciably better than before. Since August, 1906, however, we have had very marked success with ox-bile, as recommended by Conradi. Ox-bile not only prevents coagulation, but inhibits the bactericidal action of drawn

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blood and affords an excellent culture medium for typhoid bacilli. Our tests on this point have fully confirmed the previous observations of Conradi, Kayser and others.

The method followed has been to take ox-bile 90 c.c., glycerin 10 c.c., and peptone 2 grams. The mixture is distributed into small flasks, 20 c.c. in each, and sterilized. Three of these flasks are used for each examination, about 3 c.c. of blood being run into each. The flasks are then incubated, and the next morning streaks are made from each flask over the surface of a litmus-lactose-agar plate. If micro-organisms are present, a growth may be observed in five or six hours. If the growth does not redden the medium and is found to be a bacillus resembling the typhoid organism, it is tested for the Widal reaction with immune serum. By this procedure we are often able to determine if the case is one of typhoid fever or not within twenty-four hours after drawing the blood.

We give below a table of the cases included in this report:

TABLE OF REPORTED CASES.

Number.	Authors.	Number of cases.	Bacillus found	Bacillus not found.
1	Ruediger	32	20	12
2	Fox	14	1	13
3	Cole	15	11	4
4	Hewlett	25	21	4
5	Widal	25	17	8
6	Busquet	83	83	0
7	Courmont and Lesieur	37	37	0
8	Schottmueller	119	98	21
9	Kerr and Harris	56	31	25
10	Castellani	14	11	3
11	Auerbach and Unger	10	7	3
12	Kuehnau	21	9	12
13	Warfield	48	33	15
14	Janesco	19	8	11
15	Rolly	50	43	7
16	Berri	13	7	6
17	Duffy	88	62	26
18	Hirsh	97	75	22
19	Memmi	30	18	12

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Number.	Authors.	Number of cases.	Bacillus found.	Bacillus not found.
20	Richard	50	44	6
21	Perquis	40	38	2
22	Fornet	19	14	5
23	Jochmann	30	25	5
24	Harrison	8	5	3
25	Eppenstein and Korte	6	5	1
26	Ruata	12	12	0
27	Korte aud Stenberg	22	22	0
28	Trappe	38	25	13
29	Brion and Kayser	233	153	80
30	Kayser	75	50	25
31	Loiseleur	65	63	2
32	Epstein	85	68	17
33	Coleman and Buxton	123	81	42
		1,602	1,197	405

The table shows that of the total of 1,602 cases, 1,197 (or 75 per cent.) gave a positive result. The examinations were made at all stages of the disease and by different methods. Since in our experience the bile method* is the only one which may confidently be depended upon, such a large percentage of positive results goes far to prove that the bacillus is present in the blood in practically all cases of typhoid fever.

Analysis of the Cases by Weeks—The day of the disease upon which the examination was made is mentioned in 1,137 cases only. To be more exact, this represents the number of examinations, not of cases, for in many instances more than one examination was made in a case.

First Week—Of 224 examinations in the first week of the disease, 200 (89 per cent.) were positive. The earliest positive result has been reported by Widal, who recovered the bacillus from the blood on the second day of the disease. The reported positive results become more frequent as the end of the first week is approached, only, we believe, because the disease is not suspected earlier and the examinations made, or because the cases do not come under observation.

* We have not tried the glucose method of Epstein.

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Second Week—Of 484 examinations made in the second week of the disease, 353 (73 per cent.) were positive.

Third Week—Of 268 examinations made in the third week of the disease, 178 (60 per cent.) were positive.

Fourth Week—Of 103 examinations made in the fourth week of the disease, 39 (38 per cent.) were positive.

After the Fourth Week—Of 58 examinations made after the fourth week of the disease, exclusive of relapses, 15 (26 per cent.) were positive.

Very few statements are made concerning the clinical histories of the cases in and after the fourth week, though some of them are reported as severe and of long duration. As in our first analysis, the percentage of positive results is greatest in the first week and steadily declines thereafter.

We have already called attention to the remarkably successful results of Busquet and others, who recovered the bacillus from the blood in approximately 100 per cent. of their cases. Our results since the adoption of the bile method have been equally successful, standing out in marked contrast to those with broth. In all we have used this method in 34 cases. As a rule, the blood was examined as soon as a case of fever without obvious cause entered the hospital, and before the diagnosis was established. Six of these 34 cases were diagnosticated ultimately as certainly not typhoid fever; 3 of the cases pursued the clinical course of typhoid fever, but gave neither a positive blood culture nor a positive serum reaction against any member of the typhoid-colon group. In fact, after examinations of urine, feces, opsonic index and injections of tuberculin, a satisfactory diagnosis could not be made. It seems only fair to exclude these cases. One case ran an eleven-day temperature, the maximum being 101 degrees, but for the most part ranging between 99 degrees and 100 degrees. The first blood culture was taken on the eighth day. There was a difference of opinion as to the diagnosis. The patient had an old tuberculous process at one apex. This case likewise may be fairly excluded. We made three examinations of his blood.

The remaining 24 cases were typhoid fever clinically and by serum reaction and all gave positive bacteriological results. The examinations were made from the fifth to the twenty-first day in a long-duration case.

The various series of cases in the table giving approximately 100 per cent. of positive bacteriological results are too numerous

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to be accidental. They compel the conclusion that the typhoid bacillus is present in the blood in every case of typhoid fever and that failure to recover it is due to error of technique. The diminishing percentages of the larger analysis in the later weeks of the disease do not indicate, then, that the bacillus has disappeared from the blood in the negative cases, but point rather to diminishing numbers of bacilli, whose presence imperfect methods have failed to reveal. All investigators except Conradi are agreed that the bacillus disappears from the blood at or about the time the temperature falls to normal. Conradi claims that the bacillemia persist into convalescence. We have repeatedly examined the blood in the last day or two of the febrile period and not once have we recovered the bacillus. Therefore, it seems probable that the typhoid bacillus is not only present in the blood in every case of typhoid fever, but that it is present throughout the course of the disease, or at least to within a day or two of complete defervescence.

The Significance of the Bacillemia—If future observations confirm the conclusion that the typhoid bacillus is present in the blood of every case of typhoid fever throughout its course, the current conception of the pathogenesis of the disease should be modified. Typhoid fever can no longer be regarded simply as an infection of the body with typhoid and related bacilli (Bacillus paratyphosus, etc.). The typhoid bacillus may be present in the body and actively growing, yet the patient not have typhoid fever. It has been shown, for example, that the bacillus may live and multiply in the intestine of healthy persons. The patient is infested and a menace to others, but is not infected. The number of cases of biliary infection with the typhoid bacillus, without a previous or existent typhoid fever, is fairly large and is increasing. At least two cases of cystitis, caused by the typhoid bacillus in persons without a history of typhoid fever, have been recorded. (There is little probability, however, of the absorption of endotoxins in any quantity in cholecystitis and cystitis.) In the post-typhoid bone and other inflammatory lesions the lodgment and growth of the bacillus do not produce the characteristic symptoms of typhoid fever, in spite of the fact that large amounts of endotoxin should be liberated and absorbed when the abscesses are multiple. The very term used to describe these conditions, "post-typhoid," indicates that the typhoid fever *per se* has subsided. The temperature curve conforms to the so-called septic type.

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Therefore, it seems that to produce typhoid fever the bacillus must not only be present in the body and growing, but that it should grow in a situation whence it has free access to the blood. In our first paper we expressed the opinion that in typhoid fever the earliest and principal seat of infection is the blood, and that the disease should be regarded as a bacillemia. From the work done by one of us on the absorption of the typhoid bacillus from the peritoneum, and from the fact that in typhoid fever the lymph nodes and spleen contain such enormous numbers of bacilli, we are disposed to modify this view and to conclude that in typhoid fever the bacillus first finds its way from the alimentary tract to the lymphopoietic system, including the spleen, where it develops chiefly and from which it invades the blood stream. We think it doubtful whether the bacillus multiplies in the blood, but rather that its presence there represents simply an overflow from the lymph organs. Under this interpretation the presence of the bacillus in the blood does not constitute a true septicemia.

The absorption experiments above referred to also indicate that destruction of the typhoid bacilli proceeds most rapidly in the blood. This observation, together with the fact that the bacillemia persists throughout the disease, suggests the following view of the pathogenesis of typhoid fever: That the disease is caused by the destruction of vast numbers of bacilli in the blood, with the liberation of their endotoxins, and the consequent reaction on the part of the host. When the endotoxins are liberated elsewhere in the body, *e. g.*, in abscesses, the symptomatology is not that of typhoid fever.

This conception of the nature of typhoid fever is borne out by analogy. It is known that Bacillus paratyphosus may infect the intestine and produce the clinical picture of gastro-enteritis, but that when it invades the lymph organs and blood it produces a disease clinically indistinguishable from typhoid fever. Diplococcus lanceolatus and the various streptococci furnish similar analogies in that they produce different affections according to the regions they attack.

There is another matter to which we would call attention in this connection. The idea still prevails in some quarters that the course of typhoid fever may be influenced and even shortened by the use of intestinal antiseptics. Such opinion is based on an erroneous conception of the nature of typhoid fever. After in-

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vasion of the body proper by the bacillus the battleground shifts from the intestines to the blood, and the employment of intestinal antiseptics with the idea of controlling the disease is, to say the least, irrational.

The Relation of the Bacillemia to the Course and Types of the Disease; Course—The analysis of the cases in the various weeks of the disease suggests the following relation of the bacillemia to the course of typhoid fever: In the earlier stages the bacillus invades the blood in greatest numbers. Later, as the disease is approaching a favorable termination, the diminution in the number of bacilli in the blood is simply an index of less active development in the lymphatics and spleen. If the disease in any case pursues a long-duration course, that beyond the usual three weeks, the bacillus may be recovered from the blood as long as the temperature persists. We have isolated the bacillus late in such cases repeatedly. There appears then to be a definite relation in the evolution of typhoid fever between the symptoms and the bacillemia. The increasing intensity of the symptoms in the earlier period of the disease corresponds to active growth of the bacilli. They invade the blood stream in increasing numbers and are there destroyed. Then comes the stationary period, when the ratios of growth and destruction appear uniform. The steep curve period corresponds to a diminishing bacillemia, and defervescence to the complete disappearance of bacilli from the blood. In other words, the duration of the febrile movement is measured by the persistence of the bacillemia. As already stated, Conradi is the only investigator who claims that the bacillemia continues into convalescence.

Ewing has expressed the opinion that "the degenerative changes in the liver, kidneys, and lymphoid organs, while initiated by the bacterial proteids, possess certain self-perpetuating tendencies," and therefore "typhoid fever is a combination of a specific bacterial intoxication and a somewhat peculiar auto-intoxication, the former element being more prominent early, the other later in the disease, but both developing simultaneously." We are unable to accept this conception of the pathogenesis of typhoid fever. It appears inconsistent with the facts developed by our studies. We maintain that exclusive of convalescence, which should be regarded as the period of repair, degenerative changes occur only in the presence of active growth and destruction of bacilli. We have shown that convalescence is established immediately upon

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the disappearance of the bacilli from the blood, and there are reasons to believe that it is not interrupted except as the result of a fresh growth of bacilli. While the bacilli disappear from the blood at or just before defervescence, it is improbable that all the bacilli in the body have been destroyed. Otherwise, relapses and post-typhoid inflammatory lesions would be impossible. Unless then it can be shown that the symptoms of typhoid fever would persist after the complete destruction of all bacilli in the body, we think that Ewing's position is untenable.

Types—The bacillemia apparently bears no relation to the type or severity of the disease except in so far as regards numbers of bacilli. The bacillus is found in the blood equally, but not with the same persistence, in the mild as in the severe cases, and in the cases of short as well as of long duration. We have found the bacillus, for example, in cases lasting ten, thirteen, and fourteen days, and on the twenty-seventh day of a long-duration case. The importance of the definite establishment of the nature of these short-duration cases can scarcely be overestimated from the epidemiological standpoint. The serum reaction has done much to clear up their diagnosis, but the final proof has remained for the bacteriological examination of the blood. We make only a brief reference to these cases here, as we shall deal with them at length in the near future.

Relapses—The blood has been examined bacteriologically by various investigators in 33 relapses. The typhoid bacillus has been recovered in 30 (90 per cent.) of the cases. We suggested in 1904 that a relapse in typhoid fever is due to reinvasion of the blood by the bacillus. Reinvasion of the blood with destruction of the bacilli probably cause the symptoms of a relapse, but the underlying conditions which inaugurate active development of the bacilli after their growth has once been brought under control are unknown. We feel safe in asserting that a relapse is not due to reinfection with the typhoid bacillus from the intestine as the result of intestinal trauma brought about by dietary irregularities. We do not wish to intimate, however, that we believe the occurrence of a relapse is entirely independent of diet or to be understood as advocating a liberal diet in typhoid fever. We are not prepared as yet to express an opinion upon this subject.

The Relation of the Bacillemia to the Serum Reaction—In our former paper we stated that it would seem likely on *a priori* grounds that the typhoid bacillus is always present in the blood

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before the serum reaction develops, for the reason that endotoxins should be liberated before the agglutinins could be formed. The following table clearly illustrates the truth of this conclusion:

TABLE SHOWING RELATION OF BACILLEMIA TO SERUM REACTION.

Author.	Number of cases.	Bacillus found and Widal reaction negative.
Hirsh	100	23
Jochmann	30	5
Rolly	50	16
Duffy	88	18
Buxton and Coleman	123	32
	391	94

Of the 55 cases of Hirsh and ourselves, which showed the presence of the bacillus in the blood before the serum reaction could be obtained, 23 were in the first week, 26 in the second, and 6 in the third. The diagnostic value of these results in cases in which only one, or a few, serum tests have been made is important. A negative serum reaction may have no significance even in the third week of the disease. Moreover, Dr. Hastings has shown in some of our cases, especially those of short duration, that a positive serum reaction may be present for only two or three days. If the serum reaction had not been tested on those days, the result would have been recorded as negative throughout the disease. For the complete diagnosis of an obscure case by the serum reaction the tests should be made daily.

CONCLUSIONS.

1. The typhoid bacillus is present in the blood of every case of typhoid fever throughout its course.

2. The bacillemia in typhoid fever does not constitute a true septicemia, but it represents an overflow of bacilli from the lymphopoietic organs.

3. The clinical picture of typhoid fever results only from infection of the lymphopoietic organs by the typhoid bacillus, with invasion of the blood stream and destruction there of vast numbers of bacilli.

4. The endotoxins of the typhoid bacillus are not cumulative in action and convalescence from the typhiod fever *per se* is established within a few days after the disappearance of the bacilli from the blood.

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We wish to express our thanks to Pros. Loomis, Thompson and Dana for the privilege of studying the cases.

BIBLIOGRAPHY.

Berri. Clin. med. ital., Milan, 1904, xliii., 209.
Brion and Kayser. Deut. Arch. f. klin. Med., 1905, lxxxv., 552; Münch. med. Wach., 1906, liii., 823.
Conradi. Deut. med. Woch., 1906, xxxii., 58.
Duffy. Jour. Amer. Med. Assoc., 1905, xlvi., 1558.
Eppenstein and Korte. Münch. med. Woch., 1906, liii., 1149
Epstein. Prac. New York Path. Soc., 1906, N. S., vi., 106.
Ewing. Prac. Path. Soc., Philadelphia, 1905, N S., viii., 65.
Fornet. Münch. med. Woch., 1906, liii., 1053.
Harrison. Jour. Roy. Army Med. Corps, 1906, vii., 126.
Hirsh. Jour. Amer. Med. Assoc., 1906, xlvii., 1922.
Janesco. Centralbl. Bakt., orig., 1904, xxxv., 762.
Jochmann. Ztschr. f. klin. Med., 1904, liv., 408.
Kayser. Münch. med. Woch., 1906, liii., 1953.
Korte and Sternberg. Münch. med. Woch., 1905, lii., 985.
Loiseleur. Thèse de Paris, 1906.
Memmi. Rif. Med., 1904, xx., 841.
Perquis. Thèse de Paris, 1904.
Richard. Inaug. Diss., Leipzig, 1904.
Ruáta. Policlinico, Rome, 1903, x., 516.
Rolly. Münch. med. Woch., 1904, li., 1041.
Trappe. Ueber den Nachweis der Typhusbazillen im Blute der Typhuskranken, Breslau, 1904.
Widal. La Semaine méd., 1906, xxvi., 547.
For the earlier literature, see
Coleman and Buxton Med. and Surg. Rep. of Bellevue Hospital, 1904, i., 97.

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A CASE OF TYPHOID FEVER ASSOCIATED WITH CHOLELITHIASIS, CHRONIC SUPPURATIVE CHOLECYSTITIS AND HEPATIC ABSCESSES.*

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AND
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(*From the Pathological Laboratory of Bellevue Hospital.*)

Since the original publication in 1890 of Gilbert and Girode's[1] article dealing with the occurrence of the typhoid bacillus in a case of suppurative cholecystitis, an abundant literature has accumulated proving the frequent association of the typhoid bacillus with lesions of the biliary tract. As a result of the large number of casuistic contributions to this subject, it has been firmly established (1) that, during the course of a general typhoid infection, the typhoid bacillus regularly finds its way into the gall-bladder and is excreted with the bile; (2) that it may remain latent in the gall-bladder for an indefinite period of time without causing local lesions; (3) that typhoid bacilli persisting in the gall-bladder may be discharged into the intestine with the bile, and that such persons may, in this way, become "typhoid carriers" or distributors; (4) that the typhoid bacilli, instead of remaining as innocuous parasites in the gall-bladder, may form the nucleus for the development of calculi, or may cause a catarrhal or suppurative cholecystitis, with or without an infection of the biliary ducts. Such an inflammation may occur in the course of a typhoid fever, or at any subsequent time; (5) that rarely, in the absence of any antecedent history of general typhoid infection, typhoid bacilli may cause "primary" lesions of the biliary tract. Such cases have been reported by Cushing,[2] Wilson,[3] Richardson,[4] Guarnieri,[5] Stewart,[6] Burlew,[7] Pratt,[8] Blumenthal,[9] Forster and Kayser,[10] and others. Although the objection may always

* Presented by Dr. Martin at a meeting of the New York Pathological Society, October, 1908.

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be advanced that there may have been a previous mild attack of typhoid fever unnoticed or forgotten by the patient, the number of cases seems so great that it is pushing skepticism too far to deny the occasional primary localization of the typhoid bacilli in the gall-bladder.

The case here reported, though difficult of interpretation in some regards, is sufficiently interesting to merit consideration. On admission to the hospital, it was looked upon as one of acute lobar pneumonia and acute gastro-duodenitis of alcoholic origin. After two or three days' observation and a closer investigation of the previous history, the jaundice and local abdominal signs, cholelithiasis was diagnosticated, and the possibility of the correct diagnosis being typhoid fever then presented itself. The Widal reaction was returned as positive on the third day after admission, and a blood culture taken on the second day following, confirmed the diagnosis by the presence of the typhoid bacilli in pure growth. The essential points in the history follow:

Jane S., aged 25 years, a housewife by occupation and the mother of two children, was admitted to Bellevue Hospital to the service of Dr. Egbert Le Fevre on August 17, 1908, at 1 p. m., with a temperature of 105° F., pulse 120, resp. 28. She had been sick nine days with dry cough, pain in the left side of the chest, vomiting and epigastric pain. She had been treated at a dispensary for dry pleurisy, and had been drinking immoderately to dull the pain and distress. She had been jaundiced for five days and stools were acholic.

Past Illnesses—Cholera-morbus when a child, and influenza (?) some years ago. In February, 1907, was treated in Bellevue Hospital for gastro-enteritis. This attack was accompanied by severe pains in the epigastrium which radiated to the back, tenderness and vomiting. Though she has had similar attacks at various times since, she has never had jaundice before. These attacks were accompanied by dull aching pains in "stomach."

Present Illness—Began in a manner similar to the previous attacks, but the symptoms of pleurisy soon developed. Had shortness of breath, dry cough and severe pain. Had no nosebleed and no headache, no diarrhœa, no chill, no marked paroxysmal pain. Vomiting ceased two days before admission.

Physical Examination—Medium sized, well developed, stout and somewhat anaemic, with marked icterus; lungs, consolidation of upper right lobe, with a few crepitant rales; dry pleurisy on left side at the base and slight general bronchitis. Abdominal walls are thick with fat, soft, distended by tympanites; tenderness in epigastric region and over gall-bladder area; no tumor. Liver is easily palpated 3 inches below costal margin; edge smooth, tender. Spleen, because of fullness in that region, is not palpable. Skin shows icteric hue; no roseola.

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Course—Patient's temperature ran a continuous course between 102° and 105° for three days, and then continuously between 102° and 104° for a week longer, dropping rapidly to normal on August 28, the twenty-first day of the disease; varied between 100° and 101° on the twenty-second day, when, after a second drop to normal, it steadily rose, again reaching a point above 104° on the twenty-fifth day of the disease, became more remittent (101°—104°) till death on the twenty-ninth day (September 5). The pulse was rapid, feeble and dicrotic, ranging between 110 and 136, and later as high as 140-150. Respirations were rapid most of the time, 35-45-48. Lungs, upper left lobe, presented signs of consolidation on second day following admission; distinct sings of resolution in both upper lobes were found on August 25. General bronchitis became more marked, numerous small and large rales and subcrepitant rales being heard over both lower lobes.

Patient complained frequently of severe pain in left lower axillary region and on August 26, nine days after admission, of stabbing pains in right hypochondriac region. Examination of the gall-bladder area was always difficult on account of the abdominal distension, but a distinct rounded mass was felt apparently connected with the liver. Palpation of this tumor caused great pain; ice bags gave some relief. Spleen was indistinctly palpable this day.

On August 29 the patient complained of considerable deafness, but no pain in either ear. On September 3 the left ear drum perforated, and on the following day the right. A sero-purulent discharge came from both ears. The patient's general condition which was bad from the first, became very serious on August 31, and remained so until the end.

The blood showed a leucocytosis of between 13,000 and 35,000. The polymorphonuclear cells were relatively and absolutely increased (83-93%). The urine contained a trace of albumin, bile and some hyaline and few granular casts. Diazo reaction positive.

Death took place on the 29th day of the typhoid fever. The jaundice remained, varying slightly in intensity on several days. There were no chills.

From the records of the necropsy performed by Dr. Pappenheimer, twenty-eight hours after death, the following notes may be abstracted:

Body is that of a quite well nourished female, apparent age 30. Skin and conjunctivae show a marked bright yellow icterus, and there is icteric staining of all body tissues and fluids. Panniculus is abundant. Musculature well developed but pale. On opening the peritoneal cavity there is found a small amount of somewhat sticky sero-fibrinous exudate in the dependent portions. A few fibrin threads are present on the visceral serosa.

Liver projects a hand's breadth below the ribs in the median line, and there are fresh fibrinous adhesions between the anterior surface and the diaphragm. The omentum is adherent both to the lower pole of the spleen and in the region of the pylorus and gall-bladder, where it forms a thickened, firmly adherent mass. The lower pole of the spleen reaches to the costal margin. The pleural cavities are free from fluid. Lungs are adherent to the diaphragm by a small amount of fresh fibrin.

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Heart—Relatively normal in size. Right auricle is filled with yellow clot; valves and orifices are normal; musculature is strikingly moist, pale and flaccid. There are a few minute sub-endocardial petechiae. The aorta is delicate and free from atheroma throughout.

Lungs—Show fibrinous pleurisy, lobular pneumonia and bronchitis.

Liver—Weight 2745 grammes, and is enlarged in all dimensions. The surface, especially of the left lobe, is covered with a fine deposit of recent fibrin, and there are a number of yellowish-green, raised prominences on the surfaces of all lobes, which on section correspond to collections of greenish pus. On section the left lobe of the liver is riddled with suppurative foci, which on closer examination show a central yellowish core, surrounded by greenish zone, corresponding in the gross everywhere to the small bile passages. The right lobe shows a smaller number of similar foci. On opening the duodenum, a thick, golden-yellow fluid, mixed with considerable detritus, exudes from the papilla, without exerting pressure on the gall-bladder. A probe passed into the duct from the duodenum enters the gall-bladder, and hepatic ducts without difficulty. The common duct, upon being split open, is found filled with thick, yellowish detritus, is everywhere widely patent and contains no calculi.

Liver, stomach and duodenum were removed en masse, and an attempt made to dissect out gall-bladder and ducts. The gall-bladder is buried in a mass of adhesions, the cavity is filled with the same thick, yellowish-brown material as the common duct, and shows a number of sacculated diverticuli, containing smooth, non-facetted calculi, varying in size, the largest about the size of a cherry-pit. The precise relationship of the cystic and hepatic ducts to the gall-bladder cannot be made out; some of the calculi appear to be in the branches of the hepatic ducts. In all, there are about a dozen stones. On splitting up the intrahepatic portion of the cava, there is found at the point of entrance of the left hepatic vein, a small thrombotic mass, about the size of a pea, and an underlying focus of suppuration in the vein and adjacent tissue. The portal vein is free from thrombus, and appears normal.

Spleen—Slightly enlarged.

Pharynx, Larynx and Trachea—Normal.

Stomach—Normal.

Intestines—Small and large intestines are normal throughout, save that the mucous membranes are somewhat paler than normal. The Peyer's plaques and solitary follicles are not macroscopically visible, except by transmitted light. The intestinal contents consist of a small amount of unformed, bile-stained fecal material. The lymph-nodes are very small; pale—without gross areas of necrosis.

Uterus, Tubes and Ovaries—Practically normal.

Kidneys—Show lesions of parenchymatous degeneration.

Adrenals and Bladder—Normal.

Brain—Normal.

Both middle ears are filled with greenish pus. Sphenoidal sinus also contains purulent exudate.

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Anatomical Diagnosis—Typhoid fever; suppurative cholecystitis and cholangitis; cholelithiasis; lobular pneumonia; zbrinous pleurisy, acute bronchitis; acute sero-fibrinous peritonitis; suppurative otitis media (double).

Bacteriological Examination—Bacillus typhosus was twice isolated from the blood during life. Smears from the liver at autopsy showed numerous Gram negative bacilli and a few Gram positive, lancet-shaped, indefinitely encapsulated diplococci. Cultures were made from peritoneum, liver, gall-stones, spleen and middle ear.

The gall-stones were carefully washed in 1:1000 bichloride and sterile water, and then mashed in sterile Petri dish with broth, and plated on agar. Streak plates on ascitic agar were also made from the liver, in an attempt to isolate the diplococci. This was unsuccessful, plates being overgrown by the typhoid bacillus.

From the peritoneum, liver, spleen, gall-stones and ear, a motile Gram negative bacillus, giving all the cultural and fermentative reactions of the bacillus typhosus was obtained, practically in pure culture. Positive agglutinations were also obtained with an immune rabbit serum of known titer.

Histological Findings—Liver. Sections were taken for examination from various portions of the liver, and stained by the usual methods. The essential and most striking lesions found are widespread and irregular areas of necrosis, to which are added the evidences of an acute inflammatory reaction.

Taking for description such a necrotic area, we find a central bile-stained core surrounded by a broad zone of disintegrating liver cells in every stage of necrosis. In many cases such an area is sharply circumscribed and the adjacent liver lobules, though tangentially compressed, are well preserved. In other cases the necrotic area is walled in by a broad zone of leucocytic infiltration. This is especially the case about the larger areas, where it may be so extensive as to give them the character of abscesses. Bacteria (bacilli and cocci) may or may not be present in the necrotic areas; where found, they are situated principally in the central portions of the necrotic foci.

Striking changes are found also in the liver capillaries. Whereas the portal radicles and the hepatic arteries are distended with well-stained red blood cells, the capillaries themselves contain remarkably few well preserved red blood corpuscles. Instead, they are dilated and more or less filled with granular and hyaline detritus, and large cellular elements, which in many cases are attached to the capillary wall and may be definitely identified as swollen endothelial cells. Frequently large cells lie free within the capillary lumen, and it is impossible to decide whether they are to be regarded as exfoliated endothelial cells, or as dislodged parenchymal cells which have found their way into the capillaries as a result of the extensive destruction of the liver substance. Polynuclear leucocytes are found rarely, small round cells with intensely staining nuclei are more abundant.

In general, there is little increase in the interstitial tissue of the organ. In some regions, however, the periportal connective tissue is

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distinctly more abundant than normal, and evidence of recent proliferation is afforded by the presence of lymphoid and plasma cells and fibroblasts in considerable numbers. In the neighborhood of the necrotic areas, the periportal connective tissue frequently presents an oedematous appearance.

The central veins are found in some sections filled with a structureless hyaline material, staining faintly blue with haematoxylin. The liver cells in the ventral portion of the lobules contain considerable bile-pigment, those of the peripheral portions often show a moderate grade of fatty infiltration.

The biliary ducts and the portal vessels, even those in close proximity to the necrotic areas, are absolutely normal. The significance of this unexpected finding we shall consider later.

The histological findings in the remaining organs may be passed over with a word. In the spleen, were found a few small areas of focal necrosis. In polychrome methylene blue preparations, a few short bacilli were found. Plasma cells were very abundant, many having two or three nuclei.

In the lungs there is present an acute bronchitis and peribronchitis, with relatively large numbers of lymphoid and plasma cells in the exudate.

On summarizing the features of this case we should like to emphasize the following points: The absence of any definite history of previous typhoid infection; the presence of vague symptoms of over a year's standing, referable to gall-stone disease; the sudden onset of an acute febrile disease, with icterus and other symptoms pointing to lesions of the gall-bladder and liver, and a complicating lobar pneumonia; the typhoid septicæmia. At the autopsy we find a chronic cholecystitis with calculi, irregular necroses and abscesses in the liver, and as a result of the bacteriological examination, evidence of a generalized and local infection with the typhoid bacillus. On analyzing this case, especially as regards the sequence of the various lesions, we meet with various problems. The important question as to whether the typhoid cholecystitis was a primary infection or the sequel of an unrecognized typhoid infection at some previous time, it is impossible definitely to decide. Possibly the illness described as influenza may in reality have been a mild typhoid. Details are wanting, but that the typhoid cholecystitis is of long standing, is evident from the character of the lesions. The lesions in the liver are especially difficult to interpret. The study of the sections seems to indicate that the essential histological feature is a necrosis of the liver cells, and that the inflammatory changes observed about some of these areas are of secondary importance. The marked lesions found in the capillary endothelium would perhaps

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suggest a primary toxic influence as a principal factor in the causation of the lesions. Although occasional organized parietal thrombi were found in some of the branches of the portal veins, and more recent hyaline thrombi in some of the hepatic veins, it seems hardly warranted to ascribe the widespread liver necrosis to these factors, particularly as there is no affection of the larger portal vessels. The biliary ducts, with few exceptions, are normal, so that there is no ground for considering the liver lesions as caused merely by an infectious cholangitis. We can only say that in the course of a chronic typhoid infection of the gall-bladder there developed an acute typhoid septicæmia, associated with marked necrotic lesions in the liver.

Of course, it is not possible to say that the patient was a typhoid distributor, but in view of the recent German research work, and the case so well described by Soper, it certainly appears probable.

We desire to express our thanks to Dr. Alwin M. Pappenheimer for his assistance and advice.

REFERENCES.

1. Gilbert et Girode. Contribution a l'Etude Bacteriologique des voies biliaires. Comptes rendues de la Soc. de Biol., 1890.
2. Harvey Cushing. Typhoidal Cholecystitis and Cholangitis. Bull. Johns Hopkins Hosp., 1898, p. 91.
3. O. S. Wilson. Primary Typhoid Cholecystitis and Cholangitis. Journ. Am. Med. Assn., 1908, May 16, p. 1607.
4. Richardson. Cholecystitis due to Typhoid Bacilli, Boston Med. and Surg. Journ., 1897, December 2, p. 570.
5. Guarnieri. Contributazione alla patogenesi delle Infezioni Biliari, Rev. Gen-Ital. di Clin. Med., 1897.
6. Stewart. Primary Typhoidal Cystitis with Calculi, Am. Medicine, 1904, p. 1018.
7. Burlew, J. M. Typhoid Cholecystitis with Calculi, without Evidence of Typhoid Fever. Medicone, Oct., 1903. (Abstracted in Am. Med., 1903, p. 959.)
8. Pratt. Typhoid Cholecystitis with Observations upon Gall-stone Formation. Am. Journ. of Med. Sciences, 1901, Vol. 122, p. 584.
9. Blumenthal, T. Muench. Med. Woch., 1904, No. 37.
10. Forster and Kayser. Ueber das Vorkommen von Typhus-bazilien in der Galle von Typhus kranken u. Typhus-bazillentragern. Muench. Med. Woch., 1905, August, p. 1473.
11. Soper. Work of a Typhoid Distributor. Journ. Am. Med. Assn., June 15, 1907.

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A CASE OF TYPHOID FEVER IN AN INFANT OF SIX MONTHS.*

By Alwin M. Pappenheimer, M. D., *Pathologist.*

(*From the Pathological Laboratory of Bellevue Hospital.*)

The patient was a child six months of age, which was admitted to the service of Dr. Lockwood on April 5, 1906. In the history the only noteworthy points were the absence of any previous illness, and a recent exposure to measles. The child had been breast-fed at first, and the last few months fed on condensed milk and barley water.

Six days before admission it became suddenly feverish, refused food, and in this condition, which persisted, was brought to the hospital. There had been no conjunctivitis, cough, convulsions, epistaxis or rigidity of the neck noticed. On admission, the temperature was 104°, pulse 160. The child was well nourished and developed, was restless, apparently delirious, and looked very ill.

Physical Examination—Showed an extensive maculo-papular rash on the trunk and upper extremities, a coated tongue, and a palpable spleen. There were no meningeal symptoms and no abdominal distension. Until its death, which occurred on the 15th, or eight days after admission, the temperature persisted high, ranging between 102° and 105°. During this time the spleen was regularly palpable. There was at times slight abdominal distension. The stools, which at first were yellowish, toward the end became greenish, with mucus and slight traces of blood. A general bronchitis developed, the possibility of measles being excluded from the character of the rash. From the subsequent course of the illness, a tentative diagnosis of typhoid fever was made. Two attempts to isolate the typhoid bacilli from the stools were unsuccessful. A positive Widal reaction was returned from the Board of Health on the 7th, although the dilution was not stated. With a laboratory culture, a positive reaction could not be obtained higher than 1-10. Dr. Hastings also reported a negative agglutination reaction.

Leucocyte counts on April 8 and 14 were 6,700 and 8,200, respectively, the lymphocytes forming about 60% of the total.

The autopsy which was performed twenty-four hours after death was limited to the abdominal and thoracic viscera. Briefly, the only noteworthy lesions found were the following:

The posterior portion of the lungs was slightly atelectatic, and there were a few small wedge-shaped hæmorrhagic infarctions.

* Proceedings of the N. Y. Path. Soc., Vol. VII., Nos. 5 and 8, New Series, October, 1907, to January, 1908 (October meeting).

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The liver was fatty, and on the surface were a few hæmorrhagic punctæ. The gall-bladder was normal. Sections of the liver showed a few typical small areas of focal necrosis.

The spleen at autopsy was not noticeably enlarged.

The kidneys showed acute parenchymatous degeneration and microscopically small areas of acute interstitial nephritis.

The stomach contained a small amount of mucus, but otherwise appeared normal.

The small intestine was entirely free from ulceration. The Peyer's plaques were visible, and a few near the cœcal region seemed very slightly swollen and were pink in color. The solitary follicles were not macroscopically distinguishable. The small intestine contained thin, finely-divided feces. Microscopically, the plaques and follicles were hyperplastic, with small areas of necrosis in the center of the follicles.

In the large intestine the mucous membrane appeared slightly thickened, rough and mammillonated, but was free from ulceration. The solitary follicles were not visible. There was a moderate enlargement of the mesenteric lymph-nodes, the largest in the ileocœcal region measuring about 3 cm. in its longest diameter. On section they were dark pink in color, and very succulent, and microscopically showed the usual hyperplasia, with necrosis in the germinal centers, and marked hyperæmia.

Pour plates were made from the spleen, using Hiss plate medium, and agar. All the plates showed numerous colonies of a slightly motile Gram negative bacillus. The transplants yielded pure cultures of the typhoid bacillus, as identified by the fermentation reactions, and other cultural characters. In a fresh broth culture, the motility was active. The agglutination reactions with an immune rabbit serum of maximum titer of 1-30,000 was positive after three hours at 1-10,000, and after twenty-four hours at 20,000.

The case, therefore, is definitely one of typhoid fever. The only noteworthy feature, from a pathological point of view, is the absence of intestinal ulcerations. Whether this is a constant feature of the disease, as it occurs in early infancy, I am not prepared to say, since the number of authentic cases in children under a year are too few to permit of generalization.

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ORIGINAL COMMUNICATION.

A CASE OF GENERALIZED INFECTION IN AN INFANT, WITH A BACILLUS OF THE PARATYPHOID GROUP.*

By Alwin M. Pappenheimer, M. D., *Pathologist.*

(*From the Pathological Laboratory of Bellevue Hospital.*)

The following case, one of generalized infection with a bacillus of the paratyphoid group, is of considerable interest:

A Hungarian baby, three months old, was brought to the First Medical Division, Bellevue Hospital, on September 6, 1907. The history throws little light on the source of the infection. The baby had been fed with grocery milk, said to have been boiled and then diluted slightly with cold "standing" water. It had been poorly nourished since birth, vomited frequently and cried often. Otherwise it had been fairly well until a week before admission, when it vomited and cried continually. There had been no cases of "fever" or other illness among the grown people or children who came into contact with the baby. The child was emaciated, feverish, fretful, and appeared exceedingly ill. The veins of the head were dilated. The fontanelles were open, and not depressed. The pharynx, ears and nose were negative.

The lungs were filled with coarse rales, and there was a suspicion of bronchial breathing in the right axilla.

The heart was normal.

The abdomen was not distended or retracted.

The liver and spleen could not be felt.

There was no skin eruption—only a few excoriations. There was a suspicion of Kernig's sign, but no rigidity of the neck.

Blood examination showed 25,000 leucocytes, of which 47% were polynuclears, the rest lymphocytes; no plasmodia. The temperature, which on admission was 103°, fell within twenty-four hours to normal, but from this time ran an extremely irregular course between 104° and sub-normal, as seen in the chart. Two days later there was noted in the history a stiffness of the neck, and slight opisthotonos. The fontanelle was bulging.

The diagnosis in this case was made in a rather curious way. A specimen of the spinal fluid was withdrawn two days before death and sent to the laboratory. The fluid was absolutely colorless and clear, and there was no sediment for microscopic examination. In order to assure ourselves of its sterility, a culture was made on blood-serum. The

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following day there was an abundant whitish growth, a smear from which showed a short, rather plump Gram negative bacillus. Although we considered this to be probably a contamination, we nevertheless planted it on various media, including dextrose, mannite, lactose and saccharose serum water, and Hiss tube medium. The organism proved to be a bacillus of the paratyphoid group, since it produced gas in Hiss tube medium, coagulated dextrose and mannite, but failed to ferment lactose or saccharose.

Active motility was present in broth culture.

In the meantime, the child had died. The necropsy was not performed until forty-eight hours after death, but the body showed fair preservation. The conditions found were briefly, the following:

The gastro-intestinal tract showed no lesions of consequence. The Peyer's plaques were visible, but were not ulcerated, hyperplastic nor congested. The solitary follicles in the large or small gut could not be distinguished. The mesenteric lymph-nodes were small, pale and firm. The spleen was small, firm, dark red, smooth on section; the follicles could not be seen with the naked eye. The kidneys were pale and moist, showing the usual appearance of an acute parenchymatous degeneration. In the lungs were a few areas of lobular pneumonia.

The only lesions of interest were found in the head. There was no meningitis and the brain showed nothing abnormal save slight pial oedema. The longitudinal sinuses, however, from the vertex to beyond the torcula, was filled completely with an adherent friable reddish-grey thrombus, which extended a short distance on either side into the lateral sinuses. There was no thrombosis of the petrosal sinuses, however. Both middle ears contained purulent exudate.

We had, then, as the sole lesions a suppurative thrombosis of the longitudinal sinus, a double suppurative otitis, and a lobular pneumonia, doubtless terminal. Bacteriologically, the case was one of generalized infection with a bacillus of the paratyphoid group. Pure cultures were obtained without difficulty from the spleen, bile and from the thrombus itself. All the transplants examined showed an actively motile, small, Gram negative baciilus, which fermented dextrose and mannit with gas production, but which did *not* ferment lactose or saccharose, which produced an initial acidity in litmus milk, followed by a permanent alkalinity with partial clarification, and which rendered neutral-red agar fluorescent within forty-eight hours. The agglutination reactions indicate that the bacillus belongs to the paratyphoid bacillus group.

An immune serum obtained by inoculating rabbit with transplant from bile culture agglutinated homologous strain completely up to 1-320, partially at 1-640. The Schottmiller-Muller Paratyphoid (Type A) was not agglutinated by this serum in a dilution of 1-40. Baeillus typhosus was agglutinated at 1-40, but not in higher dilution.

Microscopic sections of the various organs have shown nothing of special interest, and a description of the histological findings may therefore be omitted.

The case is presented as an instance of paratyphoid infection in a three-months' infant.

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ORIGINAL COMMUNICATION.

A CASE OF HYDROPHOBIA.*

By Robert J. Carlisle, M. D.

Assistant Visiting Physician, Bellevue Hospital.

David W., born in Russia, aged 15 years, a school boy, was admitted to Bellevue Hospital, Ward 25, at 2 p. m., on October 19, 1908. He was in a very delirious and excited state, and for that reason was transferred in the early evening to Ward 30 (of which ward I was in charge), with the statement that he had been bitten by a dog.

The patient was actively delirious, requiring restraint to keep him in bed, but he could be aroused easily from his delirium and his attention fixed so that he could and would answer questions intelligently, and with an evident desire to be accurate in his answers. He was a very bright and intelligent boy.

The following history was obtained from his father, who said:

That on October 17, two days before admission, he, the father, noticed in the afternoon that the boy looked queer, and he asked him how he felt. The reply was that he felt nervous, and he was going to lie down to sleep. He did so, but could not sleep. He ate very little supper, and going immediately to bed was still unable to sleep, and he said he saw things beside the bed. The next day (Sunday) he ate very little breakfast, and said he felt as though there was a lump in his stomach. That afternoon he tried to wash his face, but came running into the house short of breath, saying the water made him "feel funny." He ate nothing, but in the evening drank with difficulty a cup of tea. He would not attempt to sleep alone that night, saying he was afraid. About 1 o'clock that same night he got up to get a drink of water, but came back very much frightened and short of breath, the same as in the afternoon. He was restless the rest of the night. Next morning (Monday) he remained in bed and asked that some warm milk be given him with a spoon. This he took with difficulty. The family called in a physician, who asked him to drink some water, which he refused to do, and again his breathing became gasping. The physician told the father to bring him to Pasteur Institute in New York (he lived in Bayonne). They brought him to New York, to the lower East Side, his former residence, to consult their former family doctor, who advised his being brought to Bellevue.

Three weeks before these symptoms began the patient was bitten on the right cheek by a dog, but the wound was so slight nothing was thought of it at the time. The boy explained to us during lucid moments of his

* Read at the November (1908) meeting of the Society of Alumni of Bellevue Hospital.

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delirium that he had not been bitten but only "squeezed" by the dog, because if he had been bitten blood would have been drawn, and there was no blood. The dog was a stray dog, and had been in the company of the children for a half hour before the patient saw him, and he was the only one bitten, he attempting to read the tag on the dog's collar when the animal snapped at him.

Condition on Admission—Very much excited and apprehensive, talking constantly, usually of books and stories he had read. Eyes wildly staring; pupils widely dilated, reacting, however, to light and distance; conjunctiva congested. Tongue, small, dry, coated with white fur, slightly trembling, mouth dry, with some thick, tenacious saliva about the lips. When cold air or fluids suddenly struck him, he was hyperaesthetic and he had gasping respiration—slight though distinct contraction of respiratory muscles.

Temperature on admission the second day of disease was 100.8°, pulse 110, respiration 28. Declining food and drink. On his right cheek were several red papular spots that might have been caused by the teeth of an animal.

He was very noisy during the night; did not sleep at all. When spoken to, he became lucid and rational in his replies, but relapsed into delirium, talking in a low monotone and at times suddenly crying out. He did not snarl nor attempt to bite those about him, nor was there any cough or cry that simulated the bark of a dog. He generally refused milk and water, but when urged sometimes he consented, and then bringing it to his mouth without attempting to drink would cast it from him, saying it was poisoned, and that he was too good a detective to be fooled that way. Again he would attempt to drink and the act brought on a distinct spasm of muscles of deglutition and was accompanied by a gasping respiration.

Temperature rose to 103.8° on afternoon of this day, October 20, pulse feeble—130-140, respiration 24-28. Neither a dose of Sodium Bromide gr. xxv. nor Codein gr. ½ had any soporific effect. White blood count was 24,600, with a 90% polymorphonuclears. I asked Dr. Gregory to see him, thinking this might have been some form of insanity. That night I called Dr. Wilson, who pronounced it unquestionably hydrophobia. Knee reflexes present October 21. Still restless, sleepless and excited, requiring restraint, declining food most of the time. Priapism was a symptom at this time. Marked subsultus tendinum; no convulsions. He perspired freely at times, and at times his saliva became increased and frothy. He was rapidly losing weight. He took, on October 20, milk ʒ xi and water ʒ xi, and, on October 21, milk ʒ xiii and some chicken broth.

White cell count was now 16,000, with the same relative increase of the polymorphonuclears. In order to rule out staphylococcus or other septicaemia a blood culture was taken, which proved negative.

Temperature, which at 5 a. m. was 103.4° (and the pulse 128, respiration 28), began to rise, the patient growing rapidly weaker. At 8 a. m. temperature reached 105.4°, at 12, 106.2°, and at 5 p. m., 14 hours before death, 106.6°, pulse running between 130 and 140. The patient died at 7 a. m., October 22, four and three-quarter days from the beginning

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of the symptoms, without general convulsions or coma. No examination was made of the urine.

Autopsy—The examination of the motor zone and cerebellum showed abundant Negri bodies—the medium and smaller sizes. Four guinea pigs were inoculated, and all of them died of the disease between two or three weeks after inoculation.

Hydrophobia is a rare disease, but it appears, and cases occur with increasing frequency in this city. Dr. Anna W. Williams, in a paper read at Rochester, N. Y., last March, tabulated the deaths in the City of New York, stating that they averaged four a year before 1906; in that year there were twelve deaths, and in 1907 twenty-eight. The number of proved cases of rabies (in animals) were sixty-three in 1906, and one hundred and eight in 1907. Most cases occurred in the latter part of each year. Since 1904, in Bellevue, the year when the present system of record keeping was begun, there have been six cases of hydrophobia, including the case here reported. In four of these cases the Negri bodies were found, of the other two, in one the diagnosis was said to be confirmed on autopsy, but no statement was made as to the Negri bodies; in the other, no autopsy was obtainable, but the diagnosis was scarcely doubtful clinically. In addition to this, one child was admitted for preventive inoculation, having been bitten by a dog proved to have had rabies.

Date.	Sex.	Age.	Negri Bodies.
Oct. 30, 1905.....	Male.....	22	Present.
Jan. 7, 1907.....	Male.....	19	Present.
Aug. 9, 1907.....	Male.....	35	Present.
May 30, 1908.....	Male.....	30	No statement
Oct. 19, 1908.....	Male.....	15	Present.
Nov. 8, 1908.....	Female.....	7	No autopsy.
Oct. 16, 1907.....	Female.....	5	Pasteur treatment, bitten by rabid dog.

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A CASE OF SEPTICAEMIA, PROBABLY GONOCOCCAL IN ORIGIN.*

By A. M. Pappenheimer, M. D., *Pathologist.*

(*From the Pathological Laboratory of Bellevue Hospital.*)

The interest of the following case lies in the fact that it is one of general gonococcal septicæmia, originating from the suppurative salpingitis and pelvic cellulitis, but unaccompanied by endocarditis or arthritic lesions. For permission to report the clinical history I am indebted to Dr. Wm. E. Studdiford, Assistant Gynecologist, Bellevue Hospital:

The patient was a young colored woman, 23 years of age, whose previous history had no bearing on this illness. Three weeks before admission to Bellevue Hospital she had severe pains in her abdomen and noticed a vaginal discharge. This was all the history which was obtained, as the patient was delirious on admission. She was in the hospital from March 3 to March 25, and during that time ran a persistent irregular temperature, 101° to 104°, and was constantly delirious. She developed rather marked meningeal symptoms, so much so that meningitis was suspected. The spinal fluid, however, was clear and sterile. A blood culture which was taken shortly after she entered the hospital was also sterile. Pelvic examination showed the presence of a large mass in the posterior fornix. There was a profuse purulent vaginal discharge, smears from which showed Gram negative diplococci. A gonococcal septicaemia was suspected, and from March 16 until she died she was treated with injections of Dr. Torrey's anti-gonococcus serum. The only effect noted was a slight lowering of the temperature.

The post-mortem examination was interesting chiefly from a negative point of view. An encapsulated abscess containing a few drachms of thick pus was found in the posterior cul-de-sac between the uterus, rectum and right Falopian tube. There was no general peritonitis. In general, with the exception of the heart, the organs showed nothing but slight parenchymatous changes. The myocardium, on histological examination, showed areas of round-celled infiltration, degenerative changes in the nuclei, and oedema. There was no meningitis.

Smears made from the pus of the abscess showed typical gonococci. Unfortunately the abscess cavity was opened before its presence was recognized and the cultures were overgrown by contaminating bacilli.

* Proceedings of the New York Pathological Society, New Series, Vol. vii., Nos. 3 and 4, April and May, 1907 (April meeting).

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Smears from the spleen contained a great number of Gram negative diplococci; some of these were morphologically typical; others were irregular in size and staining, resembling the involution forms of old cultures, and were difficult to identify positively as bacteria. Ascitic agar streak plates were made from the spleen, but only a few extraneous colonies developed.

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THE TREATMENT OF GONORRHEAL INFECTIONS BY A SPECIFIC ANTISERUM.*

By John Rogers, M. D.,
Visiting Surgeon, Gouverneur Hospital.
AND
John C. Torrey, Ph. D.

In previous communications † we described briefly an antigonococcic serum which had been found efficacious in the treatment of some cases of gonorrheal arthritis. The results were so promising that it seemed advisable to give the serum a more thorough test in these cases and also on patients suffering with other forms of gonorrheal infection. The wider experience thus gained has confirmed our earlier conclusions and seems to justify us in the opinion that this serum exercises a specific curative influence on a high percentage of cases of certain forms of infection by the gonococcus. So far as we have been able to determine in a review of the literature, this method of treatment had not been employed previous to our preliminary communication.

Preparation of the Serum—At the beginning of these experiments it was considered possible that an antigonococcic serum, to be effective, should exercise some antitoxic influence. Accordingly, as was stated, ascitic broth cultures, from six to fifteen days old, were exclusively used in the inoculation of the animals. A satisfactory serum may be produced in this way, but not as potent a one as by a method which will be described below. The use of ascitic broth cultures was abandoned principally for the following reasons: In the first place protective experiments with guinea-pigs indicated that the immune antigonococcic serum did not exercise the slightest antitoxic activity; and, secondly, the repeated injection of the free gonotoxin in the culture media

* From the Department of Experimental Pathology, Loomis Laboratory, Cornell University Medical College.

† The Journal A. M. A., Jan. 27, 1906, 261 and 263.

Reprinted from the Journal A. M. A., 1907, Vol. XLIX., p. 918.

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had a disastrous effect on the rabbits which were used in the production of the serum. Although they suffered little from the first five or six inoculations, soon after they reached a condition of hyper-sensitiveness to the toxin and finally succumbed to a dose that would never have proved fatal to a normal animal. This seems to indicate, as Wassermann and others have pointed out, that the toxin in the culture media is not produced in diffusible form by the living gonococcus cells, but is an endotoxin derived from the dead and disintegrated gonococci.

At this time it was noted that some rabbits, which were being immunized to twenty-four-hour ascitic agar cultures, withstood the inoculations very well and raised a serum, which in high dilutions agglutinated the micro-organisms. Accordingly, a similar method of procedure was followed in producing a serum for therapeutic purposes. The cultures were grown for from eighteen to twenty-four hours on large slants of ascitic agar, the culture tubes averaging one inch in diameter. It is essential to obtain a luxuriant growth. This is best accomplished by planting from an eighteen to twenty-four-hour stock culture to medium of the following composition: Meat, peptone, 2 per cent. agar is prepared in the usual way and titrated to 1.5 per cent. acid to phenolphthalein. One part of rich sterile ascitic fluid is then added to two parts of this agar. For the first inoculation the growth from one of these tubes, about three square inches of surface, was emulsified in physiologic salt solution and injected living into the peritoneal cavity of a large rabbit. For the next inoculation the emulsion from two tubes was given. This was continued until the animal had received seven or eight inoculations, about fifteen tubes in all, during a period of two months. All the blood was then drawn from the carotid. The rabbits withstood inoculations of this character far better than when ascitic broth cultures were used.

In producing the first sera various rabbits were given different strains of the gonococcus with the idea of determining if certain cultures were better adapted for the purpose than others. It was soon evident that some cultures raised a far better serum than others, and also that a patient might respond favorably to a serum produced by culture A, but not to that from a rabbit immunized to some other strain, as G.

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On the other hand, the patient from which culture G was isolated was not benefited by injections of serum produced with culture A. The probability suggested by such data, that the gonococcus family is heterogeneous rather than homogeneous, has been substantiated by agglutination experiments, which have shown that various strains of gonococcus may raise agglutins which are entirely distinct. The details of these experiments have been published elsewhere.* Because of this evidence of the existence of several groups in the gonococcus family the serum has recently been made as far as possible polyvalent. Cultures representative of the three principal groups, which have been found in the gonococcus family, are employed in immunizing the animals. This procedure seems to have found justification in a higher percentage of favorable therapeutic results.

As far as our experience has gone the agglutination test has proved to be a valuable index of therapeutic potency. A serum which agglutinated in high dilutions the various strains used in its production, always proved to be markedly curative. Such a serum agglutinated some cultures in dilutions as high as one to twenty thousand or fifty thousand. This test, of course, merely indicates that the animal is highly immunized, for the agglutinins themselves have probably nothing to do with the curative properties of the serum. In fact some sera with a low agglutination power may prove moderately effective. Others, however, are valueless and no feasible laboratory method has yet been found of distinguishing between them.

Rabbits were at first used exclusively in producing the serum. Although a very potent serum may be obtained from these animals, it was found that the serum itself is decidedly toxic for some individuals and may produce a rather alarming reaction. This matter will be discussed presently in greater detail. In order to obviate this serious objection we have experimented with goats and sheep. Similar objectionable properties, although less in degree, were found to be present in goat serum, but from sheep serum they seem to be entirely absent. Accordingly in later work only these animals have been used. They should be full grown, uncastrated males. In immunizing these animals it has been found advantageous

* Torrey (J. C.): Jour. Med. Research, 1907, XVI., 2.

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to pursue the following plan: The first inoculation may consist of the twenty-four-hour surface growth from eighteen square inches of solid culture medium, emulsified in about 30 c.c. of physiologic saline solution, and heated for one-half hour at 65° C.

We have always employed ascitic agar, made according to the method described. There seems, however, to be no reason, a priori, why any solid medium on which the gonococcus grows luxuriantly should not be substituted for ascitic agar, although no experiments have been carried out to determine this point. The inoculations are always given intraperitoneally. After an interval of about a week the second injection should be given consisting of the growth from about thirty square inches, heated as before. On the third inoculation, after the same time interval, about eighteen square inches of unheated culture may be used. On the fourth this is increased to thirty square inches of culture, and on the following inoculations thirty-six to forty-five square inches of unheated culture should be employed. A record should be kept of the weight and general condition of the animal and the amount and the time of the inoculations varied accordingly. It is sometimes necessary to revert to the use of heated cultures. After nine or ten inoculations have been given, a little blood should be drawn and the serum tested for agglutinin. If the animal gives evidence of being highly immunized it is bled to death from the carotid and the serum collected. This serum is then filtered and tested for sterility.

The strains of the gonococcus which have been used in producing this serum were selected because, after an extended series of experiments, they gave evidence of being distinct varities as far as agglutination was concerned. Such a selection of varities is a long and tedious process, but is essential for the best results. Some strains are much more toxic than others, and obviously the less toxic ones should be used in the first inoculations. If no attempt is to be made to produce a polyvalent serum a strain should be used which raises agglutinins readily and is decidedly toxic. A few experiments will show that there is a great difference in these respects between various cultures of the gonococcus.

Treatment—This serum has been found to be efficacious in the treatment of some of the complications arising from the

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primary gonorrheal infection. Acute urethritis, vaginitis and conjunctivitis are not markedly benefited by the serum, and for the treatment of these infections it is necessary to resort to other agents. A probable explanation of this peculiarity may lie in the fact that many of the infecting micro-organisms are not reached by the serum circulating in the blood and lymph. However this may be, acute urethritis should be allayed by the usual methods in order to obviate the possibility of a subsequent relapse.

The complications which are amenable to serum treatment may be conveniently grouped according to their mode of origin in two classes: (1) Those arising by direct extension of the primary infection into organs like the prostate, epididymis, testicle, bladder and Fallopian tubes, in direct continuity with the primary focus; (2) those due to the entrance of the micro-organism into the circulation, either directly or through the lymphatics. These lesions include arthritis, iritis and the rarer endocarditis, pleuritis and meningitis. Gonorrheal peritonitis may generally be more correctly placed in the first group.

In cases which are pyemic or suppurative in character with abscesses in the joints, tendon sheaths, subcutaneous tissues, periosteum and viscera, there is always the possibility of a mixed infection, and the usual surgical treatment is necessary. After the pus has been freely evacuated the serum may prove useful in freeing the body from any gonococci which have not been eliminated by this treatment.

The pathology and diagnosis of these lesions need not be discussed here as they are matters of text-book knowledge. It is sufficient to call attention to the fact that all of the above complications are more or less amenable to treatment with an antigonococcic serum according to the degree of accessibility of the parts involved to the systemic protectic fluids. The major part of our experimental work has been directed to the treatment of gonorrheal inflammations of the joints. The measure of success which has been attained in this field is indicated in the appended report of cases.

Method of Administration—The serum has always been given in small doses, viz., 2 c.c. or about 40 minims. No experiments have been carried out with larger amounts, as this quantity of potent serum has been found sufficient to act de-

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structively on the gonococci without danger to the patient. This dose has generally been injected into the loose subcutaneous tissue between the deep fasciæ and the skin in the upper arm, using the other arm on the second injection. Any other convenient point, however, may be used. In the treatment of some of the patients the injections have been given in the neighborhood of the affected joints or deep in buttock. It seems doubtful, however, whether any special advantage attaches to this method. The injections have been repeated, as a rule, every other day. In this regard one must be guided by the general condition of the patient and the degree of the reaction to the serum. In some instances it is necessary to allow an interval of four to six days to elapse between the injections.

With ram serum the only reaction that one may anticipate is a varying amount of local swelling, redness, heat and soreness around the point of injection. This does not occur, by any means, in every individual, and is not caused by any antibody in the serum, but is due to the local toxic action of the serum itself. As the same serum has been found to cause reaction in one individual but not in another, it is partly referable to the idiosyncrasy of the patient.

Toxic Effect of Rabbit Serum—As has been stated, rabbit serum was found to be far more toxic to some individuals than that of the sheep. This marked toxicity, however, manifested itself in only ten of the seventy-five cases treated with rabbit serum. With sixty-five patients there occurred either no local reaction or a very mild erythema. The toxicity may be exhibited by a more intense local reaction, which increases in degree with each injection, or it may take the form of a rather alarming general reaction. The local reaction generally appears in a mild manner after the first injection by moderate pain, redness and swelling. This increases, however, with subsequent treatments and reaches its maximum after three or four have been given. The severe local disturbance occurred in five cases out of seventy-five treated with rabbit serum. As an example of this type the following case may be cited:

CASE I.—Male, with chronic gonorrheal arthritis and cystitis for five years. February 27, 1906, 2 c.c. rabbit serum injected into the left arm. Moderate pain and swelling for forty-eight hours. March 1, second injection of 2 c.c. rabbit serum into the same arm; pain and swelling as

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before. March 3, third injection of the same amount of serum. Next day the arm was greatly swollen and very painful. Patient feverish. An abscess feared, but none formed. The fourth and fifth injections, on March 12 and March 17, respectively, were followed by only moderate local reactions.

The generalized systematic reaction which appeared in five cases is of a much more serious nature. It is worthy of note that four of these patients were in a very poor physical condition, having suffered from a gonorrheal infection for several years. The details of two of these cases follow:

CASE 2.—C. W., exhibited the prolonged chronic form of gonorrheal rheumatism with involvement of nearly all the joints of the extremities. He received the first injection of 30 minims of rabbit serum October 27, 1905. This was repeated October 29, October 31 and November 3. Then on account of the local inflammation, the injections were suspended until November 11. On this date he received 40 minims of rabbit serum, and in less than a half a minute suffered from a feeling of suffocation, which was accompanied by a general superficial "flush." At the same time there was an effort at coughing. The pulse was very rapid and feeble, and the patient was greatly prostrated. After the administration of a little aromatic spirits of ammonia, the cutaneous blush and the severe dyspnea subsided, but the weakness and rapid heart action continued some hours. The following morning all these alarming symptoms had disappeared, but on the next day, the administration of 20 minims of the rabbit serum caused a repetition of the disturbance, though not quite as severe. Two weeks later, 20 minims of the serum was given without uncomfortable results. When the quantity of serum was again raised to 40 minims, however, a similar train of symptoms, in quite a severe form, resulted. Again, after the lapse of two weeks, 20 minims were given without any toxemia. Thus the quantity of the serum and possibly the time of administration were factors in this peculiar and sudden intoxication.

CASE 3.—S. had suffered from gonorrheal arthritis for several years. Beginning March 26, 1906, the injection of 2 c.c. of rabbit serum was given every other day for three doses without any reaction, but after the fourth injection of the same amount of serum, about eight days after the first treatment, the patient suffered from chills every afternoon. Temperature 102° F. in the afternoon and 100° F. in the morning. The chills were accompanied by general prostration and aggravation of pain in the joints. The same symptoms followed the next three weekly doses, but after that, twelve injections of the same amount of serum were given until September 1, without any general disturbance. About September 23, the patient received an injection of 2 c.c. of goat serum. Within half an hour he became semi-comatose and remained so for about twenty-four hours. Later treatments with sheep serum produced no ill effects.

The histories of these cases have been given in detail for the reason that some of the symptoms are decidedly sug-

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gestive of those occurring in guinea-pigs which have received injections of foreign serum at certain definite intervals. It has been determined by Rosenau and Anderson,* and also by other investigators, that, although a single injection of normal horse serum may be entirely harmless to the animal, a second injection of a certain amount of the same serum after an interval of over ten days will often prove fatal within an hour. Some of the symptoms of this intoxication are coughing, retching, respiratory distress and coma. This condition of hyper-susceptibility or anaphylaxis (Richet) does not manifest itself, however, if the second injection is given in less than the incubation period indicated. Furthermore, if the injections of serum are repeated every few days, the guinea-pigs become immune or, more correctly, refractory (Gay and Southard †) to the toxin in the serum instead of anaphylactic. Such being the case, it seems unlikely that the toxemias which arose in these patients after several injections of rabbit serum may be brought in line with the serum anaphylaxis of these animals, for the primary treatments have been given at much shorter intervals than the essential incubation period and should have induced refractory rather than a hyper-sensitive condition. Although some of the symptoms, such as dyspnea and semi-coma, occurring in these intoxications are suggestive of anaphylaxis, they are also characteristic of the poisonous action of endotoxins derived from various proteid substances, such as bacteria and tissue cells. It is possible, then, that we are dealing here with toxemia of this character. As we have stated, sheep serum has never given rise to the slightest generalized toxemia and may be used without fear of untoward results.

Report of Cases—During the past two years the serum has been distributed widely to applicants from all parts of the country and especially to many of the hospitals in this city. Histories and reports of the cases have been obtained in nearly every instance. About 22 per cent. of them have been treated personally by one of us (Rogers). We have spared no effort to obtain reports from as many cases as possible, whether we had reason to anticipate that the result would be negative or positive. The majority of the patients who have

* Jour. of Med. Research, xv., No. 1.
† Jour. of Med. Research, xvi., No. 2.

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been treated with the serum were suffering with gonorrheal arthritis. We have collected reports of ninety of these cases, in which the diagnosis was reasonably sure and on whom the serum had received a fair test. These were of all degrees of severity and had lasted from a few days to several years. Forty-seven were mono-articular cases and forty-three poly-articular. By the use of the serum seventy-two, or 80 per cent. of these patients were entirely cured, or much improved, and eighteen or 20 per cent. showed very slight or no improvement. Fifty-seven of these patients had received other forms of treatment for periods of a week to several years with slight or no improvement and were very much improved or entirely cured by the serum.

For further discussion these cases may be divided into: (a) acute, subacute and early chronic, (b) prolonged chronic.

(*a*) *Acute, Subacute and Early Chronic Cases of Gonorrheal Arthritis*—In this list are included those of six months or less duration. Of cases of this character there were seventy-five. Of these, sixty-four of the patients, or about 85 per cent., reacted very favorably to the serum, while with eleven, or approximately 15 per cent., the result was negative. These cases were for the most part of two to eight weeks' duration. The number of injections required averaged five. Thirteen of the patients were cured with three or fewer injections, and of these, four with only two injections. One patient recovered quickly after one treatment. Twenty-three patients were cured in ten days or less, and of these, six in six days or less.

The first injection often causes a transitory increase in the soreness of the joints and sometimes a moderate rise in temperature. Some improvement may be manifest at this point, but it generally appears first after the second or, at most, after the third injection. This is indicated by an approximation of the temperature to normal and a lessening of pain, and sometimes of the swelling. Often, however, the pain disappears from the joint much more rapidly than the swelling. The latter may then be advantageously treated by massage.

With two patients whose ankles were involved a periosteal tenderness on the plantar surface of the os calcis persisted, although the other symptoms were greatly or entirely re-

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lieved. Our statistics seem to show that the serum acted quite as effectively in cases in which there was a marked swelling of the joints with more or less redness, as on those in which the joint symptoms were less acute. There may be room, possibly, for a difference of opinion on this point. The following case reported by Dr. G. W. Webster, of Chicago, on February 2, 1906, illustrates well the rapidity with which the serum acts on some of these acute cases:

CASE 4.—Patient, male, adult. First attack of gonorrhea two months before. Severe arthritis involving the right knee had been present for three weeks. The joint was much swollen, and the extreme pain rendered it almost immovable. The treatments during this time had included hot air, aspirin, nux vomica, protargol, urotropin, methylene blue, and oil of sandalwood. The patient was doing badly. At this time several injections of antigonococcic serum were given. After the first injection the pain almost entirely disappeared. It was completely gone at the end of the second day. On the third day he was able to move about freely and put some weight on his foot. At the end of a week the effusion was gone and the patient was walking about the house without the aid of a cane. In ten days from the beginning of the treatment he was completely well.

There seems to be no doubt in such a case that the rapid recovery was entirely due to the specific action of the serum. A second case is similar in character, with the exception that the patient had had several previous attacks of gonorrheal urethritis and the rheumatism was becoming chronic. The serum, it may be said, has acted as favorably in such cases as in those in which the patient was suffering from a primary attack of gonorrhea, but if there have been several previous infections of the joints the case always proves very obstinate. This case was reported from the third medical division of Bellevue Hospital, New York, by Dr. Satchwell, house physician, July 30, 1906:

CASE 5.—Patient, male, single, 30 years old. Has had five previous attacks of gonorrhea; the first ten years previously and the last ten weeks previously. The last attack was treated with injections at a dispensary. A slight discharge continued to time of admission to hospital. Eight weeks ago, after the discharge had diminished, the left wrist and the right knee began to swell. The swelling became marked, but redness was absent. Pains severe, aching in character. Three days later the left hip became painful and stiff. Patient felt feverish, but had no chills. Two weeks previously one of the toes of the left foot began to swell and became very painful. Since then the patient had been unable to move either lower extremity or the left hand on account of pain and stiffness.

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July 14. Gram-negative intracellular diplococci were found in smear from the urethra. On July 16, the left thigh was held in position of flexion and internal rotation. Marked tenderness about the joint; temperature 99° F. July 17, antigonococcic serum injected deep into left buttock. Severe aching pains in the joints, lasting for two hours, followed the injection. A slight rise in temperature. Joint conditions unchanged.

July 18. Tenderness in hip and wrist very much less. Motion in hip greater. July 19. Temperature normal. Serum given into the left buttock. Similar pains as on July 17 for two hours. July 20. Up in a chair. Tenderness in hip and wrist very much less. None in knee. July 21. Serum given into buttock. Pain again for several hours. (NOTE: This transitory pain in the lower extremities is apt to follow the deep injection of the serum into the buttock.) No tenderness. Up and about the ward. Temperature 99° to 100° F.

July 22. Up and about the ward; no pain or tenderness except at the site of the injection of the serum. Walks with a slight limp. July 23. Serum given as before. Pains for several hours. Temperature 100° F. July 30. Discharged from hospital, cured. No pain. No tenderness. Walked well. No limitation in any of the affected joints. Temperature normal. The following leucocytic counts show little change before and after the serum was administered, except an increase in the number of lymphocytes and a drop in the polynuclear neutrophiles.

	Before. July 14.	After. July 24.
Leucocytes	11,200	12,000
Polynuc, neut	65 per cent.	56.5 per cent.
Lymphocytes	28 per cent.	36 per cent.
Large mononuclears	6 per cent.	5.5 per cent.
Eosinophiles	1 per cent.	.5 per cent.

(*b*) *Prolonged Chronic Cases of Gonorrheal Arthritis*—The very chronic or protracted examples of this form of the disease, which may persist for months or years, do not readily recover under any treatment, and when there are pronounced deformities or ankyloses a complete cure is impossible. But with perseverance and the judicious use of a potent antigonococcic serum a great deal of good may be accomplished in a fair percentage of these otherwise hopeless invalids through the cessation of pain and active inflammation. To these patients the serum should be given twice a week for a month and then at intervals regulated by the symptoms. Ordinarily it is not wise to give a second injection before the reaction from the first has entirely subsided, as the discomfort may be considerable.

At the end of a month or more in a favorable case there is a gradual lengthening of the period of well-being after each

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administration of serum, and it may be necessary to give it only once in two or three weeks. In one of these cases the administration of the serum caused after a time the disappearance of shreds, apparently prostatic, from the urine. The pain in the joints followed a parallel course, decreasing with the disappearance of the shreds. After an interval when no serum was given, signs of recurring inflammation appeared, preceded by the appearance of the shreds. Another injection of serum, however, brought relief again, which continued for a longer period than before. The patient is still under the treatment and is steadily improving.

If there is no sign of a change for the better in a chronic case after four injections, we have found it useless to continue the treatment. It is impossible, of course, to explain every negative result, but if there is no improvement after treatment with a potent serum there is a possibility of an error in diagnosis or of infection by a strain of gonococcus for which the serum contains no specific antibodies.

As an example of the treatment of these prolonged cases, the following history may be cited:

CASE 6.—J. H., aged 31, single, male, had a first attack of gonorrhea in October, 1897. There was a constant urethral discharge for about one year, during which an epididymitis occurred and persisted for some weeks. In March, 1899, there still existed a moderate gleet. At this time the right hip became painful and stiff. Some months afterward, the left hip became involved and then the joints of the feet and spine. The patient tried every available "cure," including a severe course of mercury and iodid of potash at Hot Springs, Ark., but the rheumatism persisted, sometimes a little better and again worse. In March, 1907, he was able to dress himself only with assistance and was just able to get about. Both shoulders were stiff and painful; the "knuckles" of the hands were painful and swollen; the knees and ankles were in the same condition and showed over each joint one or two sharply limited areas of maximum tenderness. The urine contained an abundance of shreds, but in them no gonococci could be definitely identified. There was an increased frequency of urination and the prostate was slightly sensitive, but not appreciably enlarged.

During March, April and May, 1907, sheep antigonococcic serum has been administered about every eighth day. After each injection there occurred a noticeable improvement in the joint symptoms and the patient was able to put on his shirt and coat without assistance for the first time in years. As the pain decreased, the sleeplessness was greatly improved. The symptoms, however, would recur several days after receiving the serum, but was relieved by another injection. At first there was no change in the second glass of urine and it was not until the end of

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April that the shreds became noticeably less. This patient is still under treatment, but at present attends to all his affairs and moves about like a normal man. There is only a moderate amount of thickening around the basal joints of the right index and middle fingers, and some tenderness around the arches of both feet. The latter seems to be incipient flat-foot condition, as it is made worse by long standing or walking, and the muscular condition is poor.

In the following case, reported by Dr. W. A. Germain, of Sioux Falls, S. D., the recovery was rapid and complete:

CASE 7.—Patient, male, suffering with chronic gonorrheal arthritis and cystitis, had been under treatment for five years. During this period he had received almost every form of treatment, including deep injections, prostatic massage and thermotherapy. The patient received six tubes of antigonococcic serum during the period from February 27, 1906, to March 30, 1906. After the first injection a quantity of shredded mucus was voided with the urine and the pain in the neck of the bladder entirely disappeared. The rheumatism was not improved. After the second injection, there were pus and shreddy mucus in the urine, but no improvement in the rheumatism. The urine became clear after the third injection, but the joint symptoms remained the same. The fourth injection brought about a decrease in the rheumatic pains, and after the fifth they disappeared. The patient since then has not had any return of the symptoms. The rabbit serum, which was used, caused a marked local swelling, which soon subsided.

Tendosynovitis—Reports have been received from six cases of tendosynovitis which were treated with the serum. In four instances a cure was effected, while in two a primary improvement was followed later by a relapse. As a rule, these cases have responded very quickly to the serum and have required only three or four injections.

Infections of the Genito-Urinary Organs—Dr. George K. Swinburne,* of New York, has already published a report of the treatment of several cases of epididymitis with antigonococcic serum. Further experience has borne out the promise of the earlier results. We have received reports from eight cases of this character. Six were entirely cured within a few days, one was very much improved, and in one there was no improvement. One to three injections have generally proved sufficient to effect a cure. The pain has markedly lessened or ceased in nearly every instance after the first injection. The following case, reported by Dr. Swinburne, is of interest:

CASE 8.—The patient appeared at 10 p. m. with a first attack of epididymitis, which had started at 2 p. m. of that day and had steadily increased. The epididymis (left) was exquisitely tender, and distinctly

* The Journal A. M. A., Jan. 26, 1907.

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enlarged. An injection of serum was given. At noon on the next day there was no pain and the testicle was not nearly as tender. On the following day there was no trace of any trouble. Another injection of serum was given. Two days later the urine was clear for the first time in a month.

This case illustrates the value of the serum in aborting incipient cases. The following report on a case of chronic gonorrheal cystitis is also furnished by Dr. Swinburne:

CASE 9.—W. K., aged 28, single, contracted gonorrhea first in 1902. This was followed by some prostatitis and cystitis. In May, 1906, massage of the prostate was begun and followed by some improvement, but there was a constant slight urethral discharge and the urine was always cloudy with pus. In November, 1906, the prostate was practically normal, but both the first and second glasses of urine were cloudy with pus and contained Gram-negative intracellular diplococci. Massage of the prostate and bladder irrigations with 10 per cent. argyrol solution were continued for four weeks, without improvement. Between January 5 and February 2, 1907, the patient received nine injections of antigonococcic serum (sheep), and on February 9 all traces of the disease had disappeared. One month later, after a "beer test," the urine was found to be clear.

The history of our only case of gonorrheal salpingitis, which recovered quickly after operation and one injection, indicates that the serum may prove of value in this condition. It is, of course, impossible to determine exactly to what extent the serum hastened recovery after the evacuation of the pus :

CASE 10.—E. J., aged 21, domestic, entered St. Francis Hospital April 29, 1907, with a history of leucorrhea and cystitis for the past week. Five days previous to admission pain began in the pelvic region and later forced her to go to bed. Examination showed a moderate purulent leucorrhea, extreme tenderness and marked rigidity in the hypogastrium, uterus fixed and immovable, lateral fornices very tender, and a large, painful and tender mass behind and at the sides of the uterus. Temperature 103° F., pulse 120. April 30, under ether, a small puncture was made in the vault of the vagina behind the cervix and about six ounces of creamy, thick pus evacuated. Irrigation and drainage tube. This pus contained a very few organisms resembling gonococci, but no growth could be obtained.

May 1. Temperature 102° F. in the morning and the patient still complained of pain and tenderness. Considerable purulent discharge. In the afternoon 40 minims of antigonococcic serum (sheep) was injected.

May 2, temperature 100° F.; discharge much less.

May 3, temperature normal; no discharge; no complaints; drainage tube removed. After this there was rapid improvement, and on May 8 vaginal examination revealed nothing abnormal except the small granulating wound in the vault.

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With three cases of orchitis, this serum therapy has effected a cure after two to four injections. Chronic urethritis, however, has not yielded readily to serum treatment. In two out of the three cases of this character, there was no improvement after a few injections of serum had been given, but in one the symptoms disappeared. In this case of fourteen months' standing, the first injection caused a profuse discharge from the urethra, but this gradually subsided until after the third injection it entirely ceased and did not reappear. As has been explained in treating cases of acute urethritis, it is useless to employ the serum.

Infections of the Eye—A number of cases of conjunctivitis have been treated with the serum, both by local application and by injection, with little or no benefit. The negative results with such patients is doubtless due to conditions similar to those present in acute urethritis. With iritis, on the other hand, the results have been very promising in the two cases treated by the method. One of these, reported by Dr. Arnold Knapp, of New York, has the following history:

CASE II.—Male, aged 22, gonorrhea two years previously, chronic discharge for eight months. One year previously, iritis in left eye, lasting two months; recovered. February 24, 1907, left eye became inflamed; entered hospital. March 1, 1907, ciliary congestion, retina hazy, urine normal. Three injections of serum were given on consecutive days. This resulted in more congestion and the appearance of fibrinous exudate in the anterior chamber. Two more injections were given on the following days, resulting in the disappearance of the exudate. Patient felt better. During the week, March 8 to March 15, four injections were given. As a result the congestion of the conjunctiva became less, the iris normal, the pupil fully dilated, but some opacity existed in the retina. A week later the patient was discharged with the left eye practically normal. Since then there has been no relapse.

Mode of Action of the Serum—The question remains, What particular properties of this serum exercise the curative influence? In attempting to discuss this point the following clinical phenomena, sometimes accompanying the administration, are of importance. With four patients who had had a more or less chronic discharge from the urethra, the first injection greatly increased this discharge, but after the second or third the flow of pus stopped entirely. Again, in a case of iritis, the first three injections of serum caused a greater congestion and the production of a fibrinous exudate in the anterior chamber of the eye, but after two more injections this all dis-

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appeared and the eye was much improved. Finally, in many cases of gonorrheal arthritis, especially in cases of long standing, the first two or three injections cause a transitory increase of pain and inflammation in the affected joints and may, in fact, "awaken" other articulations which have lain dormant for some time, but after a few more injections the pain and swelling generally disappear and the joints regain their normal condition.

At least two possible explanations may be offered of this frequent transitory increase of inflammation, occurring in some instances within a few hours after the administration of the serum. Wassermann and Bruck * have advanced the theory that the increase of inflammation and rise of temperature after the injection of tuberculin into a tuberculous patient is due to the interaction of the tuberculin with an antituberculin present in the tissues. If a similar explanation is advanced for the phenomena under consideration, it would be necessary to prove that the antigonococcic serum contains a derivative from the gonococcus analogous to tuberculin. Although our experiments in this direction are incomplete, we have thus far found no evidence that this serum contains any appreciable amount of gonotoxin.

A second explanatory hypothesis, which may be advanced, is that the serum injected into the patient has brought about a local disintegration of the gonococci and a liberation of endotoxins. The presence of this toxin in the tissues would cause an inflow of exudate and pus, as has been determined by Schaffer † and others in man, and by Malvoski ‡ through experiments on animals. From the evidence at hand this second view seems to us the more probable.

Granting the probability that the serum brings about the destruction of the gonococci in the tissues, two views may be taken of its mode of action: First, that the primary bactericidal action has taken place directly through the presence of specific immune bodies in the serum injected; second, that it has been brought about indirectly by phagocytes, which have been aided by an opsonic action of the serum. The weight of evidence seems to be rather in favor of the first hypothesis, because the increase in inflammation occurs often

* Deutsche med. Wochschr., March 22, 1906.
† Fortschr. d. Med., 1897.
‡ Ann. de Gynecol. et Obstet., 1899, lii.

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so soon after the injection of the serum, indicating that the endotoxins have been liberated directly into the fluids and not into the protoplasm of the leucocytes. Experiments, which will be published in detail later, also indicate that immune bodies are present in abundance in this serum. And, finally, because it is evident that the primary destruction of gonococci in immunized guinea-pigs takes place directly through the agency of the fluids and not by phagocytosis. An objection might be raised to this view on the ground that 2 c.c. (the usual dose) of serum would be diluted several thousand times by the blood and serous fluid of an adult man. Other potent bactericidal sera, however, have been found to act at as high dilutions *in vitro,* and an antigonococcic serum to be effective must come from very highly immunized animals.

It is quite possible, furthermore, that the gonotoxin liberated in the tissues may play indirectly an important part in the curative process, in that it causes an inflow of exudate containing leucocytes. These phagocytic cells are then able to take up and digest more readily the remaining gonococci through their having been acted on by the serum. This idea is not an hypothesis unsupported by evidence, but it is substantiated by the increase of specific phagocytic action in guinea-pigs immunized to gonococcus. The details of these experiments will be given elsewhere. As has already been emphasized, there is no evidence that this serum is in any sense an antitoxin.

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CARDIAC COMPLICATIONS OF ACUTE RHEUMATISM.

By Alexander Lambert, M. D.,
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In presenting this paper I have accepted the title given me, although I believe that in so stating the occurrences of cardiac involvement in rheumatism we misstate the real condition of affairs and thus tend to create a false conception. Cardiac complications of rheumatism are but one manifestation of a symptom of the disease, and the involvement of the heart, in any attack of acute rheumatism, should be accepted as one of the possible and unfortunately very probable symptoms that will be manifested in the course of any attack.

This is equally true of endocarditis, pericarditis and myocarditis, and, in my opinion, there are but few attacks of the disease which do not show some involvement of the valves, the muscle or the surrounding envelope of the heart.

It is a familiar observation in children to see the cardiac involvement the main manifestation of the disease, and the joint symptoms of slight intensity. In adults, it has probably occurred in the experience of nearly all of us, to have observed a pericarditis or endocarditis manifest itself several days before the joint symptoms became evident. It certainly. therefore, seems wrong to consider as complicating occurrences lesions which occur with so great frequency and which may be the primary or even the principal manifestation of the disease.

The frequency with which rheumatism attacks the heart is usually given as from 25 to 33 per cent. In the cases recorded by Church there were 889 in which 494 or 57.5 per cent. showed signs of old or recent endocarditis; Thompson records 706 cases, occurring in the Presbyterian Hospital of New York, in which the cardiac manifestation occurred in 329, or 46.6 per cent. In 500 cases admitted in the last three years to Bellevue Hospital 253 showed recent or old endocarditis, or 56.6 per cent. We have,

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therefore, a total of 2,095 cases in which 1,076, or 51.3 per cent., showed cardiac manifestations. What percentage of the others here quoted were other forms of infective arthritis and not genuine acute articular rheumatism it is impossible to say. But in the 500 cases in Bellevue Hospital, just quoted, there were no cases included in which the small joints of the hands and feet were involved, and always two or more of the large joints showed an inflammatory arthritis. This was done to reduce to a minimum the chances of including any forms of arthritis, except the genuine acute articular rheumatic affection.

It seems safe to conclude that half the cases of acute rheumatic fever will show cardiac involvement. The age at which rheumatism occurs modifies greatly the liability to cardiac involvement; under ten years of age the liability is the greatest. The figures of Church give over 80 per cent. as the occurrence for this decade. The liability decreases with each decade, until over forty years of age the percentage is but 34 per cent. The liability to cardiac involvement in the first attack, for all ages, is 50 per cent. Here, too, taking the figures of Church, the age at which the attack occurs manifests its influence, in children under ten, 75 per cent. showed acute endocarditis and the percentage diminished until in patients over forty endocarditis was present in 12.5 per cent. In 244 first attacks his figures show 124 cases of acute endocarditis, or 50.8 per cent. In 177 cases in my statistics 89, or 50.6 per cent., showed acute endocarditis. Osler shows that while the liability to endocarditis diminishes as age advances, it increases directly with the number of attacks, while of 116 cases 58 per cent. had endocarditis in the first attack, 63 per cent. in the second attack and 71 per cent. in the third attack.

Rheumatic endocarditis forms such a large proportion of all the cardiac cases going into a general hospital, that it occurred to me that it would be of interest to see what proportion of patients, suffering from a breakdown of cardiac compensation, gave a rheumatic origin as the cause of their disease. In 200 cases of chronic endocarditis in Bellevue Hospital 125, or 62.5 per cent., were of rheumatic origin, and 75, or 37.5 per cent., were of non-rheumatic origin. As is well known, rheumatism usually attacks the left side of the heart and usually remains confined to that side, and in the majority of cases its lesions are confined to the mitral valve. In severe cases, however, there is frequently an involvement of the right side, particularly of the tricuspid valve,

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for involvement of the pulmonary valve is rare. In fact, in severe cases involvement of the tricuspid valve is more common than is usually recognized. Samsom cites 28 necropsies of recent simple endocarditis in which the tricuspid valve was found involved in 50 per cent., but in 83 cases, old and recent, it was involved in only 16.28 per cent. He concludes that acute inflammation of the tricuspid valve is of frequent occurrence in acute endocarditis, and that in severe cases it is usually present. Chronic disease of the tricuspid valve, the result of chronic endocarditis, is of much less frequent occurrence. He draws the further inference, that acute inflammation of the tricuspid valve in many instances subsides and is completely cured.

The preponderance of mitral lesions in any statistics of either acute or chronic rheumatic endocarditis is very striking. In the 89 cases in Bellevue Hospital there was a mitral systolic murmur in 68.5 per cent. of the cases. There were no cases of mitral presystolic murmur, the aortic valves were involved alone in 7.8 per cent., both aortic and mitral valves were involved in 23 per cent., and in the cases in which both aortic and mitral valves were involved the aortic and mitral systolic murmurs were present in 20 per cent. of the total, and in 78 per cent. of the cases in which both valves were affected. The aortic diastolic murmur was the least common of any murmur. This fact, together with the absence of the mitral stenotic murmur is probably due to the same cause that the processes necessary for the production of these murmurs belong, particularly to the chronic processes, as retraction and fusion of the valves must occur to produce the lesions necessary for the production of these murmurs. It is a well-recognized fact that mitral stenosis occurs most frequently in the subacute and persistent inflammations which extend over a long period of time and are more frequently connected with the chronic myocardial changes than with acute valvular affection. Sansom quotes 300 cases, in which the mitral valve alone was involved in 157, or 52 per cent., the aortic in 40, or 13 per cent. In all of the 300 cases the mitral was affected in 255, the aortic in 129, the tricuspid in 29 and the pulmonary in 3. In 283 cases of chronic rheumatic endocarditis recently analyzed by me in Bellevue Hospital, the aortic valves alone were involved in 51, or 18 per cent., and the mitral valves alone in 159, or 56.5 per cent.; both aortic and mitral valves were involved in 73, or 25.8 per cent. The tricuspid was involved in eight instances, but always in combination with other valves.

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Considering the murmurs more in detail we find that in the 51 cases of aortic lesions there was an aortic systolic alone in 22, or 43 per cent., an aortic diastolic in 5, or 9.8 per cent., and a double aortic murmur in 24, or 47 per cent. In the 159 murmurs at the mitral valve alone 124, or 77.9 per cent., were mitral systolic; 11, or 6.9 per cent., were mitral presystolic and 24, or 15 per cent. were double mitral. These statistics are interesting as showing the relative proportion as to the situation in the valves; they do not show or show but little as to the extent of the lesion which is likely to occur. It is a well-recognized fact in cardiac affections that the extent of the damage done in the valve can only be gauged by the amount of hypertrophy and dilatation necessary to compensate the valvular lesion, and the mere record of the compensation of the lesion does not help us in this all-important point. The important point to our patient is for us to be able to estimate the extent of the lesion as judged from the compensation and to make a prognosis as to how long this compensation may be expected to continue. These questions are also intimately involved with the pericarditis and with the intensity of the myocardial changes.

In considering pericarditis in a paper of such short duration that we are only able to consider the various forms of rheumatic cardiac involvement, the ratio in which they are liable to occur in rheumatic fever, and the effect on the heart in general, we can deal but briefly with this portion of the subject. Last year Dr. Davis read an interesting paper before this section on the effects of pericarditis on the heart, and he considered the clinical changes which this condition produced; I will, therefore, not touch on this aspect of the question. Pericarditis, like endocarditis, is more likely to occur in children than in adults. In a paper read last year in Boston before the Section on Diseases of Children, Dr. Dunn showed that in 300 cases of rheumatism in children, pericarditis occurred in 58 cases. In my 500 cases in Bellevue Hospital, which were practically all adult cases, pericarditis occurred in 24. Sibson, in 1877, reported 326 mixed cases in children and adults occurring in the fifteen years ending in the autumn of 1866; of these 63 showed pericarditis.

Patients in whom pericarditis develops are usually also afflicted with endocarditis and the heart is inflamed without and within. In Sibson's cases, 9 of the 63 had pericarditis without endocarditis. In my 24 cases 4 escaped endocarditis. In Dunn's

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58 cases but 2 did not show some endocardial murmur. In Sibson's cases pericarditis developed in one-sixth from the third to the sixth day after the commencement of the disease; in one half the friction murmur was audible on or about the eleventh day. In only 7 of the cases did the pericarditis show itself so late as the twenty-fifth day and from that to the sixty-third after the onset of the acute rheumatism; in one-eighth of these cases it was evident that the onset of the cardiac inflammation, both internal and external, took place at the very beginning of the disease, and at the same time with the onset of the inflammation of the joints. Dunn shows that primary pericarditis, that is pericarditis without other manifestations, is fairly common in children, and that in 30 of his 58 cases there was pericarditis alone or pericarditis with endocarditis as the sole manifestation of the infection.

In adults, pericarditis as the primary manifestation of acute rheumatism is not common, but it does occur, and I can remember three cases in the last ten years in my service in Bellevue Hospital in which the pericarditis has been the only symptom manifest for several days before the outbreak of the inflammation of the joints.

Sibson also draws some interesting deductions in regard to sex, age, occupation and the occurrence of pericarditis in rheumatics, which show that below the age of twenty-one it occurs in the two sexes in nearly equal proportions, but a little more frequently in the male than in the female. Above the age of twenty-five men were attacked three times more frequently than women. He draws attention to the great frequency of pericarditis in young servant girls. He concludes that in acute rheumatism affecting the female, that youth with labor is nearly always attacked or threatened with endocarditis or pericarditis or both, that youth without labor is thus attacked with comparative infrequency. Mature age with labor is attacked less frequently and much less severely with inflammation of the heart than youth with labor. He shows also that men following indoor occupations seem to be affected in the same ratio as the female patients, and that in men pursuing outdoor occupations, pericarditis occurs much more frequently in those of mature age when their work is hard but not when it is comparatively easy.

It is thus seen that endocarditis and pericarditis are most commonly the recognized manifestation of a general infection in children, and that in young adult life, in those whose resistance

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to the infection is reduced by overwork, the number of cardiac inflammations are disproportionately large. The liability to endocarditis and pericarditis disappears with advancing age, and only in those whose resistance is reduced by overwork and exposure does the liability to cardiac inflammation become great. When the pericardium is inflamed the inflammation is not limited to the serous membrane, but it extends down to the muscle of the heart, and we have to deal with a rheumatic myocarditis as well.

So far as the permanent effect on the heart is concerned, the pericarditis is much less serious than the endocarditis, for in the majority of cases the pericarditis clears up entirely, and it is only in those cases in which the inflammation has been so severe that the two pericardial surfaces remain adherent that the permanent results from the pericarditis are at all serious. The rheumatic inflammation of the heart, whether it starts in the pericardium or the endocardium, or begins as an inflammation of the muscular substances of the heart itself, sooner or later, whenever the heart is at all affected, produces an inflammatory condition in the heart muscle, which is being more and more clearly recognized as the greatest danger in the cardiac involvement in acute rheumatism.

Pathologically, the changes in acute myocarditis seem to be acute parenchymatous degeneration of the muscles. This can be recovered from, but when the process is protracted, it can go on into fatty degeneration which may recover or which may go into brown atrophy or fibroid degeneration. This degenerative condition is seen in the old chronic rheumatic hearts in which the inflammation is intense in the pericardium or endocardium. It may extend into the muscular substances of the heart and show a round cell infliltration of inflammatory changes. In the acute stages we see, therefore, a process which is especially prone to diminish the function and produce the dilatation of the muscle. In the chronic changes we have a process which prevents the vigorous hypertrophy necessary for the increased demands of compensation and a muscle in which brown atrophy and fibroid degeneration are prone to develop and weaken its contractile powers.

A complete description of myocarditis in rheumatism, its physical signs, its course and its varying influence on acute and chronic endocarditis is yet to be written. It seems to be true that we must accept the fact that in all severe cases of endocarditis and pericarditis the myocardium is also involved. This can be a

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general or a local involvement, and the varying course of its intensity and of its local or general involvement, coupled with the varying degrees of involvement in a single valve or in several valves, makes the accurate unraveling of the varying influences at play in any given heart, a very difficult task. We realize from clinical evidences alone that it follows the same liability to be especially prevalent in children and apparently it follows the same laws of occurrence as endocarditis and pericarditis. It may occur in a heart in which neither pericarditis nor endocarditis show any evidences of being present.

This winter, in my wards in Bellevue Hospital, in a strong young adult man afflicted with acute rheumatism in several of the large joints, the heart suddenly became more and more rapid in its action, the pulse rose from 80 per minute, in the morning, in a few hours to 110, then to 130, then to 160, and finally became uncountable. He was restless, cyanotic and suffered from intense dyspnea. This continued for several hours, but gradually subsided and after a few days of rapid action his heart came down to normal. At no time, in this heart, were there any evidences of pericarditis or endocarditis. After ten days or two weeks the man left the hospital apparently recovered, but after a few weeks he returned with a relapse of his rheumatic joint symptoms, and his heart again showed intensely rapid and weakened action. He again recovered from this without any evidences of pericarditis or endocarditis.

Another young man of 19, who had an acute attack of rheumatism and showed but a slight mitral murmur, when the joint symptoms subsided, insisted on leaving the hospital, although I tried to make him stay because I was suspicious that the cardiac processes had not subsided. In forty-eight hours he returned with an excessively dilated heart, his body generally edematous, with a large, throbbing and painful liver, face cyanotic, practically in a state of collapse.

These two cases impressed me as evidences, the first of a pure myocardial inflammation and the second of a cardiac inflammation of slight extent around the mitral orifice and of intense degree in the cardiac muscle. Myocarditis can pursue three courses, it can begin acutely, run an intense acute course and end in death (this is the least common), or it can begin with acute myocarditis, and gradually subside, or go into a long continued chronic course and last for years.

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It cannot be reiterated too often or emphasized too strongly that the cardiac affections of rheumatism occur in all their intensity without any ratio to the extent of the joint manifestations, and the intensity of the cardiac involvement in both children and adults is not necessarily in any ratio to the intensity of the other symptoms. Many of the symptoms which we have heretofore believed due to endocarditis occur with the myocarditis and must be considered as equally due to this condition. There is the sensation of pressure, of shortness of breath, of smothering oppression, of sensation of pain in the region of the heart, independent of any pericarditis, and these symptoms may all be present or any one or all be absent and still the myocarditis exist. Careful examination may show an increase in the area of the heart, dullness or a disturbance of the cardiac rhythm or an insufficiency of the mitral valve as the first symptom. After the acute condition has subsided slight deviations from the normal are more common than severe symptoms. The physical signs of acute myocarditis are first the deepening and dulling of the muscle tone, the reduplication of the heart sounds, and, if dilatation occurs, a still further loss of muscle tone, and the sound becomes slappy and valvular. The reduplication of the sound not infrequently goes on into the so-called galloping rhythm. This is most often best heard in the fourth or fifth space, near the sternum or out toward the apex; the triple sound at the apex generally means myocardial change, and the triple sound at the base a pericardial infection.

After the acute joint symptoms have subsided, it is often noticeable that the patient's temperature does not come down to normal and remain there; there is a continued run of temperature from subnormal to subfebrile, from 97 or 98 to about 100, and it may rise as high as 101. This, in my opinion, invariably means an actively continuing endocardial or myocardial inflammation. The pulse may range near normal or be slightly above. In the subacute forms, in which the degeneration of the muscle is more common than in the acute inflammatory condition, and in the chronic condition, the pulse rate may be distinctly below normal.

Heart disease, in the early half of life, is mainly of rheumatic origin, and we have come, in late years, to realize that the treatment of heart disease has more and more become the treatmnt of the cardiac muscle. We have now reached the position where we must realize that our knowledge of rheumatic endocarditis is still

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fragmentary and very incomplete. Heretofore our knowledge has been chiefly focused on the endocardial and pericardial involvement to the exclusion of the myocardial, but to-day we realize that the cardiac involvement of rheumatism includes endocarditis, pericarditis and myocarditis, and the most serious is myocarditis.

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A CASE OF VEGETATIVE ENDOCARDITIS, CAUSED BY AN UNIDENTIFIED PLEOMORPHIC BACTERIUM.*

By A. M. Pappenheimer, *Pathologist,*

and

H. H. Satchwell, *House Physician.*

(*From the Pathological Laboratory of Bellevue Hospital.*)

The case here described is of interest in that the inciting micro-organism, which was present in the blood during life, presents rather remarkable characteristics, and differs, we believe, from any of the bacteria hitherto found in association with endocarditic lesions.†

Clinical Record—The patient, aged 44 years, a janitor, was admitted to the hospital July 28, 1906, and was under observation until his death in the hospital November 25, 1906.

Previous History—Has lived in New York City for 41 years and has worked as a janitor for 1½ years; clerk for 10 years before this. Heavy drinker of beer and whiskey, with frequent excesses. Chews excessively, but smokes only occasionally. One cup of coffee daily; eats irregularly; sleeps poorly; bowels move once a day; usual weight is 135 pounds. Scarlet fever when a child; good recovery. German measles at 20 years. Fifteen years ago was in a hospital for eleven days, suffering from nervousness, insomnia, and vomiting (acute alcoholism?). Twenty-four years ago had a urethral discharge and pain on urination, lasting three months. At this time he had four sores on the penis which discharged yellow material. Under treatment these healed within a week. During the ensuing year he had two similar attacks, with multiple sores on his penis. No history of secondary symptoms.

Present Illness—Dates back two weeks. Patient awakened one morning with dull pain in both hips; when he started to walk he also felt pain on the inner side of his left thigh. This has continued, and he has also felt feverish. No other pain. Appetite is good, bowels regular. There is no dyspnœa. For past year and a half he has had a cough at times, never accompanied by much sputum. He has had about a half-dozen night sweats. He believes he has lost some weight of late. Urination

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† We are very greatly indebted to Drs. A. A. Smith, E. LeFevre, and R. J. Carlisle, visiting physicians to the Third Medical Division of Bellevue Hospital, for permission to transcribe the clinical records here presented.

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normal. No recent urethral discharges. Pain in thighs and fever are chief complaints. Upon admission: Temperature 103°, pulse 126, respiration 22.

Physical Examination—Patient is of medium frame, fairly well nourished and developed. Skin is pale, warm and moist. Mucous membranes somewhat pale. No cutaneous eruptions. Lymph-nodes palpable, not enlarged. Pupils equally contracted and react normally. Tongue is narrow, pointed, moist, clean, slightly tremulous. Pulse small, slow, of good tension, regular; radial artery somewhat thickened. Apex beat not visible or palpable. Heart sounds heard with maximum intensity in fifth space, 3½ inches to left of median line. First sound at apex accompanied by a blowing murmur, transmitted into axilla. Basic sounds indistinct; no murmurs heard. Chest well developed, expansion good. Lungs within range of normal. Liver, dullness at fourth space, flatness at sixth, extending a finger's breadth below costal margin. Edge of liver not palpable. Spleen not palpable. Abdomen not distended. No fluid, tumors, or tenderness. Tenderness on deep pressure behind trochanters; also along the course of the sciatic nerve. Patellar reflexes normal.

August 2. Since admission, temperature has been remittent between 99° and 102. + °. Pulse 80-90. No pain in back. General condition fair. Slight cough with purulent sputum. No tubercle bacilli in sputum. Yesterday and today, a few fine crackling râles heard on inspiration over lower part of left chest in anterior axillary line (fifth space). Liver palpable a finger's breadth below costal margin—slightly tender.

August 6. Since last note, temperature has been irregular, ranging between 100° and 102°. Lungs negative. Systolic murmur heard all over precordial region. Maximum intensity in third left interspace near sternum. No pain or limitation of motion in hips. Generaal condition fair. Still has a slight cough with scanty mucoid expectoration.

August 8. First blood culture taken: sterile.

August 14. Today, temperature dropped from 102.6° to 99°. Complains of severe pain and tenderness in calves of legs.

August 15. Temperature rose to 102.6°. Lungs negative. Pains in legs persist.

August 16. Today, patient had a distinct chill lasting 10 minutes, after which temperature rose to 102.2°. Lungs normal. Some tenderness in umbilical region. Examination of blood for malarial plasmodia negative.

August 21. Since last note, temperature has ranged between 99° and 101°. Pulse 78-96. General condition fair. Complains of some tenderness in both calves. No edema. Murmurs over precordium have changed. Rough systolic murmur is heard at second right interspace, not transmitted. A similar murmur at apex, not transmitted. Lungs negative. Had a slight chill last night.

August 24. Since August 21, temperature has been somewhat higher; shows daily remission between 100° and 102°. Very cyanotic today. Profuse sweating. No pain in legs. Bowels constipated. Cardiac condition unchanged.

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August 28. Temperature still irregular, ranging between 99° and 102°. Cardiac condition unchanged. Lungs negative. Spleen barely palpable. Abdomen not distended, not tender. No tenderness in legs. No chill. No eruption. Slight cyanosis of fingers and lips in mornings.

September 11. Since last note, temperature has ranged between 98° and 101°. Today patient has had chilly sensations, but no distinct chill. Very cyanotic. Complained of aching pains in shoulders. Cardiac condition unchanged. Lungs negative. Spleen palpable.

September 17. Second blood culture taken: sterile.*

September 24. Temperature, pulse and respiration continue about the same. Cardiac signs unchanged, save that murmurs are more intense. Systolic murmur present over apex has been louder during past few days than on previous note. Systolic murmur over second right interspace persists. No pericardial murmurs heard. Lungs: a few scattered moist râles over both bases. No change in voice sounds. Appetite fair. Patient says he feels weak. No skin eruption has been noted at any time. Patient complains of some stiffness in left wrist upon awaking in the morning. No pain or tenderness in joints. Has some pain in the abdomen, which is dull in character. There is moderate distension. Spleen is still palpable and slightly tender. Stools formed, very dark. No ova present.

September 28. Since last note, temperature, pulse and respiration has ranged between the limits stated on previous notes. T.=98°—100.6°; P.=72—90; R.=18—24. Patient cyanotic in the morning. Has indefinite pains in arms and legs. Left wrist slightly swollen and tender. Motion limited. No change in cardiac condition. Lungs normal. Spleen still palpable—not tender. Liver not palpable. No skin eruption. No chills, chilly sensations, or night sweats. Appetite fair. Feels very weak, and has lost flesh.

October 4. For the past four days, range of temperature has been higher, reaching 101.2° and dropping to normal. No chills, chilly sensations, or sweats. Patient is still cyanotic in the mornings.

Systolic murmurs over apex and base still present. Apical murmur is intense, transmitted into left axilla and heard behind between scapulae. Lungs negative. On October 2, patient complained of dull pains in both shoulders and arms—had no tenderness or swelling. Appetite fair, sleeps fairly well.

October 10. Temperature intermittent: 98°-100.8°. Pulse 80-84; regular. Respiration 20. Patient feels comfortable. Cyanosis, and stiffness in left wrist continue. Heart unchanged. Lungs: breath and voice sound distant over both bases. No râles heard. No tenderness along course of nerves in extremities. No edema about ankles. No eruption. Weight not taken, as patient has been continuously in bed since admission. Medication: salicylates, oil of wintergreen, tonics.

October 16. Pain in left wrist not so severe as before. Temperature, pulse and respiration same as on previous notes. Heart murmurs unchanged. No petechiae. No edema of ankles. Bowels constipated.

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* A Gram decolorizing bacillus was obtained from one of the flasks, but subcultures failed to grow. Organism was considered at the time as being probably a contaminating growth, and the culture reported as sterile.

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November 8. Temperature is still remittent in character, ranging between 99-103°. Complained of feeling chilly yesterday; no distinct chill. Physical condition unchanged.

November 10. Indistinct pains in left wrist. No limitation of motion or tenderness.

November 15. Complains of aching pains with some tenderness of left wrist. Cardiac action regular. Systolic murmur at apex is louder. Rumbling diastolic murmur is heard at apex. No thrill felt. At base over aortic area, systolic still present. Faint diastolic murmur heard here and over third left space near sternum.

Lungs show scattered moist râles. Spleen still palpable. Fourth blood culture taken: Positive. (See bacteriological report.)

November 18. Patient complains of numbness in whole of left lower extremity. Temperature is 102.4°. Pulse 108. Respiration 20. No edema; no ecchymosis; no eruption.

November 19. Still complains of numbness of whole left lower extremity with pain about left hip. Examination shows no edema; no pulse is obtained over dorsalis pedis artery. Extensive ecchymosis from middle of left thigh to middle of leg. Considerable tenderness below inner half of left Poupart's ligament. Some induration made out. Cardiac action regular. Pulse 96-100. Double murmurs at base and apex still present, but not quite so distinct as on November 17 and 18. No thrill made out at apex. Lungs show few scattered moist râles. Fifth blood culture taken; positive. (See bacteriological report.)

November 20. Temperature 102°; pulse 102; respiration 22. Ecchymosis of left leg more marked; sharply limited at middle of thigh. Marked change in surface temperature, i. e., from warm to cold, at line of demarcation. Sensation is entirely lost below this level. No edema. Almost complete paralysis of left lower extremity. Tenderness and induration extend along the course of the femoral vessels from Poupart's ligament to line of ecchymosis. No redness along this area. Some tenderness behind left greater trochanter. Lung signs unchanged. Heart regular. Blowing diastolic murmur at third left space at apex is much louder. Reduplication of second sound at apex is present at times.

November 21. Patient delirious for the first time. Marked general cyanosis. Condition of left lower extremity unchanged. Cardiac murmurs unchanged; action regular. Lungs normal, except for scattered râles.

November 22. Temperature fell from 102.8° at 8 p. m. on November 21 to 97.2° at 8 p. m. on November 22. Pulse 98-112; regular. Still very delirious, general cyanosis. Ecchymosis has extended along inner side of left thigh from its middle to Poupart's ligament. Tenderness in thigh is still marked. Some tenderness and a muscular rigidity is noted in left iliac region of abdomen. Along the lowest inch of the course of the left radial artery, there is induration with apparently slight tenderness. No pulse is felt. Few small petechiae have appeared over left elbow.

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November 23. Temperature, pulse and respiration, 99°—96—24. Still delirious. Cyanosis is moderate. Induration along left radial artery unchanged. Condition of left lower extremity unchanged. Apparently has severe pains in left leg. All the toes of right foot are cold and very cyanotic. No pulse wave felt over right dorsalis pedis and posterior tibial arteries.

Cardiac action regular. Murmurs unchanged. Lungs negative, except for scattered râles.

Abdomen slightly distended. Spleen palpable. Tenderness and rigidity in left iliac region still present. No new petechial spots. Cyanosis of right foot, sharply limited above webs of toes on dorsal and plantar surfaces.

Vomited coffee-ground material yesterday. Slight cough; no expectoration.

November 24. Moderate general cyanosis. Delirium persists. Cardiac signs unchanged. Lungs scattered moist râles. Abdomen slightly distended. Tenderness in lower left quadrant.

Condition of right foot and left lower extremity unchanged. Left radial pulse not made out. Induration along the lowest inch of its course in forearm still present. Skin over this area slightly reddened.

November 25. Patient died this a. m.

Urinalyses—Examinations of the urine were made at intervals of a few days throughout his stay in the hospital. The total daily amount ranged between 30 and 56 ounces. A faint trace of albumin and a few hyaline and granular casts were occasionally noted. The specific gravity averaged low (1.013), and the urea excretion was uniformly diminished.

The sputum was examined on nine different occasions. No tubercle bacilli were found.

Examination of the feces on several occasions showed nothing of interest.

Post-Mortem Record—Necropsy performed by Dr. Norris, 9½ hours post-mortem.

General Appearance—Body light, weight about 90 lbs., height 5 ft. 6 in., emaciated, slight general icterus. The toes of the right foot, except the big toe, show bluish discoloration, and the epidermis has peeled. The toes of the left foot (second, third and fourth) are slightly reddish in color; otherwise normal. Above the left knee for a distance of nine inches, there is an extensive bluish ecchymosis. No edema of the legs. Left thigh slightly larger than the right. Slight P. M. suggillation of back and shoulders. Rigor mortis marked. On the left elbow, externally, a few petechial spots, skin over which is desiccated. Muscles are yellowish red in color, and appear somewhat friable.

Diaphragm fifth left space, fifth right rib.

Liver—Right lobe at the free margin of ribs. Left lobe extends about 4 inches beneath the ensiform cartilage.

Peritoneal cavity contains a few drachms of bile-stained fluid in the recto-vesical fossa. Ribs are not ossified.

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TABLE I—BLOOD EXAMINATIONS.

Date.	Erythrocytes.	Hemoglobin.	Leucocytes.	Polynuclears.	Lymphocytes.		Eosinophiles.	Transitionals and Large Mononuclears.	Remarks.
					Large.	Small.			
July 29...	.....	..	17,200	73	5	14	1	7	No plasmodia.
" 28-31	.....	..	.....	..	..	..	..	..	No plasmodia.
Aug. 1...		..	24,000	80	5	2.5	0	2.5	.....
" 4...			17,300						No plasmodia.
" 7...			18,400	72	6	13	2	7	
" 16...			16,600	85	7	4	0	4	No plasmodia.
" 24...	.....	..	20,000	..	..	..	..	..	
" 29...	4,600,000	60%	14,400	77	5.5	7	1.5	8	Basoph. 1%
Sept. 8...	.....	..	24,600	..	..	..	..	..	.....
" 18...	.....	..	21,000						
" 25...	.....	..	14,000						
Oct. 1...	.....	..	18,000						
" 4...	4,750,000	65%	.....	..	..	..	..	..	
" 10...	.....	..	15,000	..	..	..	..	.	
" 20...	.....	..	12,000						
" 30...	.....	..	15,000	80	4	12	..	4	
Nov. 15...	.....	..	15,000	80	6	13	0	1	
" 19...	.....	..	12,000						
" 20...			13,200	81	3	13	0	3	
" 24...	.....	..	26,600	82	5	4	0	9	

Lungs—No adhesions or fluid in the left pleural cavity. Both lungs emphysematous. Left lower lobe somewhat firm posteriorly. In the upper part of the lower lobe, a small reddish infarct is present. On section, the lower lobe, is slightly granular, and in places there are small areas of lobular pneumonia.

Bronchi are slightly hyperemic, congested, and contain yellowish, frothy fluid in small amount. Bronchial lymph nodes are anthracotic, without evidence of tuberculosis.

There are about 750 c.c. of turbid bile-stained fluid in the right pleural cavity.

There is a considerable amount of ochre-colored fibrin between the fissures of the lobes of the right lung, which are more or less adherent. Lower lobe feels solid. On section it has a mottled appearance, granular on section and dry, and in places contains a few small yellowish foci. At the base, there is a reddish area, grumous on section, projecting from the surface (infarct). The lower half of the lobe posteriorly is in a

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condition of red hepatization, section being slightly grumous. The rest of the lung is normal.

Heart—Pericardium contains about an ounce of extremely turbid yellowish fluid. The pericardium itself is in places slightly injected, and there are a few yellowish, small fibrin floccules. Right auricle, especially the ear, is intensely injected and thickened. Right heart is somewhat distended with dark reddish blood clots. The pulmonary artery and valves are normal. Tricuspid ring admits three fingers and is normal. In the

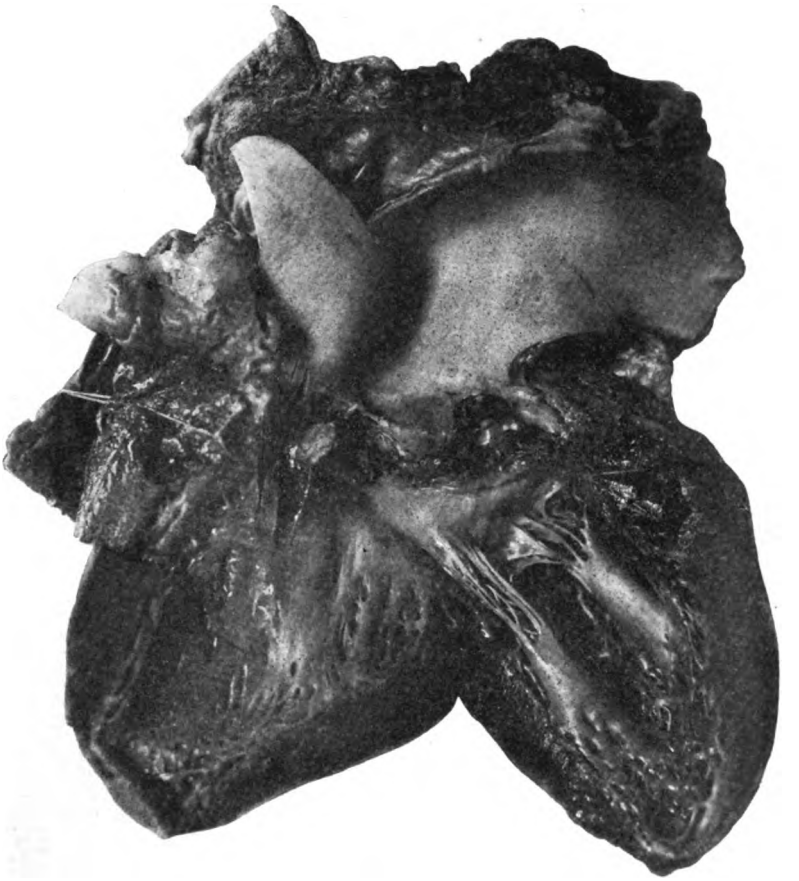

FIG. 1.—Heart, reduced one-third, showing aortic vegetations.

right auricle, there is a softened puriform thrombus, which is firmly adherent to the auricular wall. The central portion of the clot shows whitish softening. Mitral orifice admits two fingers, the valve is slightly thickened at the edges, but is otherwise normal. Left ventricle of normal thickness. Right ventricle slightly stiff, but scarcely hypertrophied. Muscle is red and normal in appearance. Left auricle is normal. Its endocardium,

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and the endocardium of the left ventricle, is slightly opaque. The three aortic cusps are markedly thickened and adherent. On section, they are in places almost 1 cm. in thickness and are composed of a firm, dry, slightly yellowish material, in several places perhaps chalky. The left posterior cusp, at its base, shows a small tear or ulceration. The right posterior is the seat of a firm mass of tissue, and in the sinus above this cusp there is a reddish clot, which is adherent to the firmer tissue, resembling that found on the cusps. The sinus shows an aneurysmal dilatation or pouch, which admits a small marble, say 25 mm. in diameter. The aorta itself is perfectly normal. The heart as a whole is somewhat enlarged.

In the left common iliac, about 2 cm. below the bifurcation, there is a firm, adherent reddish thrombus, which completely occludes the vessel, and extends beyond its bifurcation. The external and internal iliac arteries contain a soft, reddish thrombus, which is partially adherent.

Spleen—Adherent to the diaphragm. Weight 205 gms. Spleen is soft and contains an infarct, triangular on section, measuring 15 × 20 mm. There is a deep scar in the upper pole of the organ.

Pancreas—About normal in size, and firm.

Suprarenals—Normal.

Kidneys—Moderate amount of perirenal fat. Left kidney weighs 105 gms. Small and firm. Cortex thin, marking indistinct. Capsule adherent, leaving a slightly granular surface. There are a number of old scars, which extend deeply through the cortex. Kidney is extremely pale.

Weight of right kidney, 150 gms. In the upper pole, there is a mass of firm tissue, which presents a deep ochre-yellow color, about 8 mm. in length, and extending from the cortex well into the pyramid. There are likewise a number of smaller yellowish areas adjacent to it, the rest of the kidney being similar to the left. There are a few small cysts.

Ureters and urinary bladder normal.

Prostate and testicles and epididymes normal in size and to the touch, but were not examined.

Liver—On pressure, no bile exudes from the papilla. Weight 1,380 gms. Surface is slightly granular, yellowish, and cuts somewhat gritty. On section color intensely yellowish and lobulations indistinct. Gall bladder contains sticky, tarry bile.

Esophagus—Normal. One of the perigastric lymph nodes is hyperemic.

Stomach—Contains an excessive amount of mucus, otherwise normal. Abdominal and thoracic aorta normal.

Intestines—The duodenum and the upper part of the jejunum are normal. For a distance of approximately eight feet, small intestine is intensely congested. The mucous membrane is thick, and is covered with a whitish, often distinctly yellowish exudate, and in places it has the appearance of being infiltrated with pus. No superficial erosions.

The intestinal canal at this point contains considerable amount of bloody fluid. The cecum and the ascending colon contain much tarry material. The transverse and descending colon contain numerous firm scybalae.

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The lesion described above in the small intestine extends to within six feet of the ileo-cecal valve. The lower six feet of the small intestine, the cecum, and the large intestine, including the rectum, are normal.

Peyer's patches and solitary lymph nodes are unaffected.

Brain—Dura normal. Pia presents in places patches of opacity over the cerebral convexity, otherwise it is normal. Brain substance anemic. In the posterior pole of the left occipital lobe, there is an area of 3×5 cm., which is composed of softened brain substance. No yellowish color is noted.

Cortex over this area is extremely firm. Vessels at the base are normal. Lateral ventricles are normal.

Anatomical Diagnosis—Infective Endocarditis (Aortic); Mural Thrombus (R. auricle); Chr. Endocarditis (Aortic); Infective Aortitis of Sinus of Valsalva, with aneurysmal dilatation; Dilatation of R. Heart; Infarcts of Lung; Lobular Pneumonia (Discrete and Diffuse); Ac. Bronchitis; Sero-fibrinous Pleurisy and Pericarditis; Cirrhosis of Liver; Infarct of Spleen; Chr. Interstitial Nephritis; Thrombus of Common and Left External and Internal Iliacs; Encephalomalacia, Embolic, Infective (L. Occipital lobe); Ac. Hemorrhagic and Suppurative Enteritis.

Smears made at autopsy from the aortic vegetations showed very numerous slender threads, varying in length and thickness—some with bulbous ends, others tapering. No distinct branching. Decolorized by Gram's method. No metachromatic granules. No other bacteria seen.

Streaks and plates were made with glycerin and ascitic agar. The organism was not isolated in pure culture, transplants showing always an admixture of small Gram-positive bacilli and streptococci.

A typical streptococcus was obtained in pure culture from the pleural exudate, liver, spleen, and kidney. An attempt to cultivate the iliac thrombus yielded only a few contaminating colonies. No bacteria were found in smears from the thrombus, or from the softened area in the brain. Smears from the intestinal wall showed the usual polymorphous intestinal flora.

Histological Examination—The tissue was fixed in Orth's fluid, and imbedded in celloidin; for the demonstration of the bacteria in the tissues, prolonged staining with Löffler's alkaline methylene-blue was found satisfactory.

Aortic Valves—The aortic vegetations are composed principally of a dense, almost structureless tissue, which in places only has an indefinite fibrillar or laminated structure. Near the surface, but found also at a considerable depth within the substance of the valve, are irregular purplish clumps, stained more intensely at their periphery. Many of these have a fairly well-defined radial arrangement, distinguishable even with the low-power objective. With the immersion lens, in sections, stained with Löffler's methylene-blue, these clumps are seen to consist of dense masses of the bacilli, to be described below, which form tangled masses or colonies, but at the periphery of the clump, evince a distinct tendency to arrange themselves in sheaves or parallel to one another.

The morphology of the individuals is identical with that of the micro-organisms found in the smears from the vegetations, and in the cultures

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from the blood during life; the bulbous, irregularly stained filaments are readily made out. A few very long, wavy, distinctly branched forms are found, as well as numerous deeply stained coccoid bodies.

In one of the sections, there were to be seen scattered oval or polyhedral cells of large size, some with double nuclei, which suggested osteoblastic cells in appearance, although no typical bone trabeculae were present.

FIG. 2.—Section through aortic vegetation (low-power, Löffler methylene blue). Numerous colonies of filamentous bacilli within the depths of the vegetations.

Auricular Wall and Thrombus—The thrombus is composed of red blood cells, leucocytes, chiefly polynuclears, granular, and reticulated fibrin. There is no evidence of organization. Sections stained with methylene-blue fail to show bacteria.

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The myocardium, especially the papillary musculature is edematous and infiltrated with leucocytes. The individual fibers are swollen, their striations largely obliterted. The smaller blood-vessels show thickening of the muscular coats, and proliferation of the intima.

Iliac Artery—Sections taken through the wall of the vessel at the seat of the thrombus, show the lesions of an acute arteritis, involving all the coats. The endothelium is exfoliated. The internal muscular coat, especially its middle portion, is infiltrated with polynuclear leucocytes, many of them pycnotic and fragmented. The external muscular coat, and adventitia, are thickened, edematous, and infiltrated with leucocytes. The vasae vasorum are sclerotic, and there is marked perivascular round-cell infiltration. The thrombus is composed of blood-cells and hyaline fibrin, and shows no organization.

Bacteria could not be definitely demonstrated, either in the wall of the vessel, or in the thrombus.

Pulmonary Artery—Sections through thrombosed portion: Clot shows organization at the periphery. Endothelium is swollen. The mesarterial coat is not changed, but the adventitia is thickened, and its vessels congested. The surrounding alveoli are filled with extravasated blood.

Lung—In sections through the hemorrhagic infarcts, the alveoli are found packed with red corpuscles. The alveolar cells are swollen, many of them exfoliated. The walls of the alveoli are not destroyed, but in places show considerable recent connective tissue formation with sprouts of epithelioid cells projecting into the alveolar cells. In a section passing through a thrombosed vessel there is seen a partially organized clot, the center of which is puriform, consisting almost wholly of polynuclear leucocytes, more or less disintegrated. No bacteria are seen within the thrombus in methylene-blue preparations. Scattered through the alveoli are isolated pairs or chains of cocci, with an occasional plump bacillus. No micro-organisms of the type isolated from the blood and present within the heart valves can be found.

Sections through the consolidated portion of left lower lobe, present the ordinary lesions of a lobar pneumonia in the stage of red hepatization.

Liver—The lesions found in this organ are simply those of extreme passive congestion. The liver cells, in the central portion of the lobules, are shrunken, their cytoplasm is granular and eosinophilic. Their nuclei lie at the periphery of the cells, are small, and stain diffusely. Many of the liver cells contain blood pigments. The peripheral portions of the lobules in places are the seat of fatty infiltration. Some of the cells exhibit cytolytic changes, such as have been described by Oertel,[1] namely, solution of the hyaloplasm, with preservation of the reticulum and nuclear membrane, The hepatic capillaries are much dilated, crowded with red blood cells and leucocytes. The central veins are engorged with blood.

No bacteria are found in the sections, although cultures made at the necropsy yielded a pure growth of streptococcus.

Spleen—Sections were made through the yellowish infarct and adjacent splenic tissue. The infarcted area consists of a necrotic mass staining intensely with eosin, and under high magnification is seen to be composed largely of disintegrated red blood cells. Scattered through

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it are lymphoid cells and pycnotic nuclei. The margin of the infarct is formed by a cellular granulation tissue, in which are irregular epithelioid cells or fibroblasts, arranged with their long axis parallel to the long diameter of the infarct, lymphoid cells, new-formed capillaries, and abundant granular pigment, chiefly within larger phagocytes.

The splenic tissue itself shows the changes of chronic passive congestion. The blood sinuses are thickly packed with red corpuscles; there are many large cells filled with granular blood pigment; the endothelial cells of the sinuses appear proliferated. The Malpighian follicles are small. The trabeculae are thickened and show hyaline degeneration.

No bacteria are found in sections, either within the infarct or at its margin, or in the splenic tissue. Cultures made at autopsy, however, yielded a pure growth of *Strept. pyogenes.*

Kidneys—The epithelium of the tubuli contorti is swollen, irregular and granular. The lumina contain granular detritus. The tubes of Henle and the tubuli recti are in many places filled with casts. There are a number of areas of sub-capsular interstitial inflammation. The glomeruli appear normal.

The large yellowish area noted in the gross corresponds to a necrotic infarct composed of hyaline tubules, vessels, and connective tissue. The vessels show an advanced sclerosis, thickening, and hyaline transformation of the media and adventitia.

The bright yellow color, which was a striking feature in the fresh specimen, appears to be due to the deposition of golden or yellowish-brown pigment granules (hemosiderin). In some places, especially in the cellular connective tissue at the margin of the infarct, this pigment deposit is very abundant indeed

No bacteria are found. A pure growth of streptococci was, however, obtained at autopsy.

Adrenal—Sections present a normal structure. The capillaries are perhaps somewhat congested.

Pancreas—Sections of the pancreas show no noteworthy lesion. The blood-vessels everywhere are markedly congested. The acini and islands of Langerhans are entirely normal.

Small Intestine—In sections taken through that portion of the gut which in the gross showed a necrotic inflammation, the mucosa is completely exfoliated, only a few deeper acini persisting. The internal surface of the gut is formed by a thick layer of exudate, consisting of polynuclears, granular and hyaline fibrin, red blood cells, and large bacterial colonies. The submucosa is very edematous, the blood-vessels and capillaries intensely injected. The fibers of the muscularis mucosae in many places are torn apart and the purulent exudate extends into the submucous tissue. The muscular layers and peritoneum are not affected, save that the blood-vessels are intensely engorged with blood, and the intermuscular connective tissue appears edematous.

Brain—Sections from the left occipital lobe, through area of softening: Softened tissue is composed of an edematous meshwork of neuroglia fibers, in which are new-formed capillaries, and many large phagocytic cells, containing red corpuscles and blood pigment. Free unaltered red

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cells are found in considerable numbers. The adjacent brain tissue shows gliomatous proliferation, and there is a productive inflammation of the overlying pia-mater.

No bacteria are found in sections stained with methylene-blue. The histological picture is therefore that of a fairly recent thrombotic softening undergoing repair.

Bacteriological.

Reference has been made to the bacteriological examination undertaken at the necropsy, and to our failure to obtain in pure culture the micro-organism which was present in the aortic vegetations. The description of the cultural characters is therefore based upon a study of the micro-organism obtained upon two occasions from the circulating blood during life.

On November 15, a fourth blood culture was taken, the previous ones having been sterile. About 6 c.c. were withdrawn from a vein and distributed into three agar plates and one broth flask. After three days, about 25 deep and superficial colonies developed on each plate. The flask showed only a few discrete whitish colonies at the bottom, which proved to be *Staph. albus*.

Subcultures were made from the plate colonies on human-blood-agar slants, from which further transplants were made and the morphological and cultural features determined. A fifth blood culture, four days later, yielded a pure growth of an organism identical in all respects with that obtained from the previous culture. Each plate showed, after forty-eight hours, from five to ten deep and superficial colonies; the flask remained sterile.

Morphology—The most striking feature of the micro-organism is its pleomorphism. Pronounced variation in the length, thickness, and conformation of the individuals is constantly present, irrespective of the particular medium or stage of growth. Measurements therefore are of little value, since in every culture examined there are seen gradations from short bacillary forms, ranging from 2-6 μ in length up to long filaments crossing the entire field of the immersion lens, and measuring 100 μ or more in length. In hanging-drop preparations the long, thread-like forms usually exhibit more or less definite segmentation, and appear to consist of a series of individuals joined end to end. Such segmentation, however, is not always to be distinguished, even in fresh preparations, and in stained smears an interruption in the continuity of the filaments can rarely be made out.

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Variation in thickness of the individuals is also well marked, slender forms about the thickness of a tubercle bacillus perhaps predominating. The calibre is rarely uniform; frequently there is a bulbous or clublike swelling at one or both extremities, and occasionally fusiform enlargements at one or more points along the course of the filaments. The shortest forms are usually straight, the longer ones slightly curved, and the filaments often wavy.

Branching has been observed in hanging-drop preparations from broth cultures, in smears from fluid and semi-solid media (Hiss-tube medium). The precise nature of this branching is difficult to study because of the tenuous character of the micro-organism, and the fact that it grows extremely slowly or not at all at room temperature. We are nevertheless of the opinion, from a careful scrutiny of hanging-drop preparations, that *true branching*, in the sense of a lateral budding or terminal dichotomization does *not* occur, but that the forked and divisional forms are produced by a process of *pseudo-ramification*. By this is meant that two adjacent segments becoming bent upon themselves, the sheath or membrane is ruptured at the point of juncture, and the continued growth of one segment in the line of the original axis gives rise to a forked or branched appearance.

Branches are invariably given off at the juncture of two segments, and there is usually to be made out a slight gap between the main stem and the branch. Forked forms are met with, in which the two secondary segments lie at equal angles to the primary axis. In other cases, the branch is given off at a right angle.

The significance of the distinction between true and false branching in attempting to establish the identity of the micro-organism will be discussed later.

Staining Reactions—The organism stains readily, but not intensely, with all the usual anilin dyes. Prolonged staining with Löffler's alkaline methylene-blue or dilute carbol fuchsin has given the best pictures. In some preparations, the presence of metachromatic granules, usually two to each rod, could be readily demonstrated. Their location varied—in some individuals the granules were situated at the poles; in others, one or both were found in the central portion of the rod. The long filamentous forms frequently showed a considerable number of these granules.

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In later generations, metachromatic granules, though occasionally present, were not often seen.

Very interesting pictures were obtained in films fixed with methyl-alcohol, and stained by Giemsa's method. In these, the rods and filaments take a rather pale-blue stain; at irregular intervals are brilliantly stained purple granules, spherical, oval, or occasionally in the shape of short cylindrical masses with rounded ends. The terminal bulbs may be pale; frequently they contain a single purple granule, and occasionally the entire bulbous enlargement takes an intense purplish stain. The purple staining substance is not invariably distributed in the form of discrete granules or rods, but the longer filaments may take a diffuse purple color over a considerable portion of their length. Frequently, the micro-organism appears to be slightly swollen in its deeper-staining portions.

The organism is readily and completely decolorized by alcohol in less than thirty seconds, when stained according to Gram's method. It is not acid fast.

Involution Forms—A variety of irregular, swollen and beaded forms which stain poorly, are found in old cultures. In stained smears from a dry 20-day-old agar culture, numerous very long filamentous forms are seen, many of them showing a terminal deeply staining bulbous swelling. Whether these appearances are to be considered as involution forms associated with unfavorable conditions of growth is not clear; it is to be noted that similar forms were found in the smears made from the cardiac vegetations. In fluid media or in recent agar cultures on moist media, on the contrary, very long forms with terminal bulbous enlargements are less frequently seen. It is possible that the terminal swelling may be a reaction to the mechanical resistance of the firm tissues or solid media—an explanation of which has been offered and generally accepted for the origin of the clublike terminal swellings of the actinomyces within the tissues (Lachner-Sandoval,[2] Petruschky,[3] Wright[4]). Some of the short, greatly swollen segments resemble budding yeast cells in their appearance, and must undoubtedly be regarded as degeneration forms.

Capsules—Films from recent agar cultures stained by Wright's method show the individual rods and filaments to be enveloped by an unstained clear space, which is bounded by a fine but distinctly stained line. The breadth of this clear space varies, but it is relatively about as large as the capsule of the *Strepto-*

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coccus mucosus. Such a capsule could not be constantly demonstrated, but appeared to be present whenever the cultures possessed a sticky or mucoid character. That the appearance described indicates a true capsule and not an artefact, is evidenced by the presence of numerous empty capsules.

Films stained by Buerger's method present a similar picture, with, however, certain differences. The filaments themselves appear thicker than with Wright's stain, the clear spaces relatively narrower, and the limiting membrane, if we may use the term, less sharply defined.

FIG. 3.—(Eleven-day agar culture, Giemsa stain, ×1,000 diam.) Filamentous and bacillary forms with deeply stained chromatin substance.

The Hiss copper sulphate stain and the Welch stain gave similar, but less instructive, pictures.

Motility—The micro-organisms are absolutely non-motile.

Spore Formation—In all cultures, but more abundantly in older growths, there have been noted free oval or coccoid bodies whose appearance might suggest spore-formation. We are, however, disinclined to interpret them as such, but to consider them rather, as the granular remains of disintegrating bacillary forms,

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since they do not respond to the ordinary spore stain, and are readily decolorized by acid and alcohol.

The globular and spheroidal masses which take a purple or nuclear stain in Giemsa preparations, we consider to represent chromatin substance rather than endospores.

An attempt was made to determine the thermal death-point of the micro-organism by suspending a recent agar culture in broth, heating to various degrees of temperature in capillary tubes, and re-transplanting on agar slants. It was, however,

FIG. 4.—Four-day Löffler blood-serum culture. Dilute carbol fuchsin. ×1,000.

difficult to obtain a growth from control suspensions. The experiment was therefore unsuccessful.

Old agar cultures showing extreme thread formation were repeatedly examined for evidences of aerial spores. Chains of terminal gonidia, such as are invariably present in old cultures of streptothricæ, were never observed.

Cultural Characters—The organism is an obligate-ærobe. Tubes incubated under strict anærobic conditions (Novy apparatus) failed to show appreciable growth after eleven days, but grew readily when the tubes were subsequently incubated ærobi-

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cally. Growth at room temperature takes place very slowly or not at all.

Broth—The appearance varies slightly with different cultures. There is sometimes to be noted a flocculent cloud after twenty-four hours, near the surface of the tube, which gradually settles to the bottom. After two or three days, there is seen at the bottom of the tube a delicate scaly or sandy sediment; on shaking, coarser opaque whitish granules are seen in the flocculent deposit. After prolonged transplantation the appearance of the cultures in broth has changed somewhat. After twenty-four hours, there

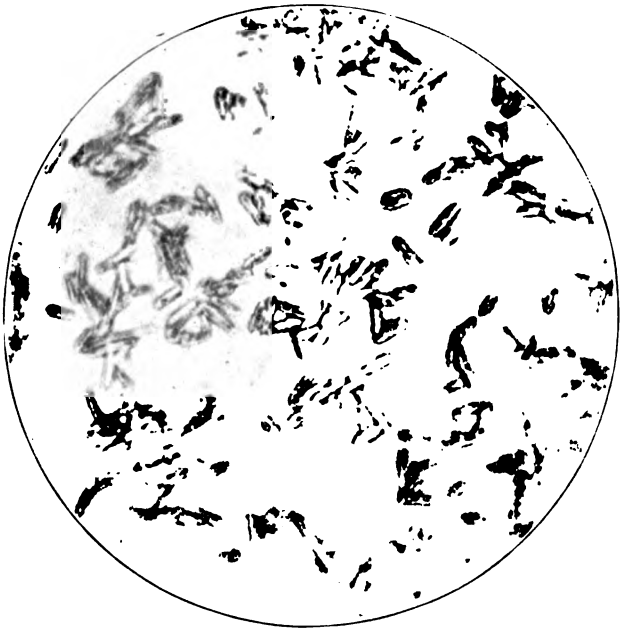

FIG. 5.—Recent agar culture. Wright's stain. ×1,000. Capsules.

appears a diffuse turbidity of the broth, with the deposition of a fine, scaly, whitish sediment along the sides and at the bottom of the tube. Further growth does not alter the appearance noticeably, save that the deposit becomes more abundant, and sediments completely as a whitish scaly deposit, leaving the supernatant broth clear. No pellicle is formed. There is no odor to the cultures.

Broth cultures tested for indol after eleven days, gave a fairly marked positive reaction.

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Gelatin—No growth is observed at room temperature, even after several weeks. There is no peptonization, as shown by growing at 37 degrees and then solidifying.

Agar Slants—The organism grows readily on plain agar. After twenty-four hours, if a large amount has been transplanted, there appears a diffuse confluent, rather sticky, grayish-white growth; as the medium becomes dryer, the growth acquires a cohesive or tenacious character, so that it adheres rather firmly to the loop. As the agar dries, the surface of the growth shows a glistening, satin-like luster.

When a small amount of growth has been transplanted, discrete colonies are formed which gradually assume the appearance

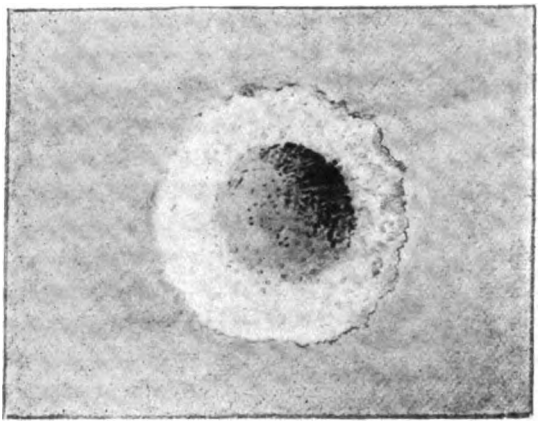

FIG. 6.—Eleven-day agar culture: single colony.

illustrated in Fig. 6. They attain a size not exceeding 1-2 mm., are yellowish-white in color, with a slightly raised, dome-shaped central knob or projection, which appears stippled and brownish by transmitted light. The peripheral portion of the colony is flat, the surface uneven or wrinkled, the margin irregular, finely serrated and raised slightly above the surface of the agar. The colonies have considerable cohesion, but do not adhere firmly to the medium.

Viability—Transplants were readily obtained from agar cultures after two weeks growth at incubator temperature, without special precautions against drying. No detailed study of the resistance of the micro-organism to drying was made.

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Glycerin-agar Slants—The appearance of the growth is identical with that on plain agar. The organism, however, tends to die out more quickly on this medium.

Blood-agar Slants—(Human blood streaked on plain agar.) Abundant confluent growth, without striking characters.

Blood-agar Plates—Upon the four plates, obtained by blood-culture (1-2 c.c. of blood to 10 c.c. of agar), the colonies appeared slowly, becoming visible only after 48-72 hours. The superficial colonies were 1-2 mm. in diameter, slightly raised above the surface of the medium, pearly white in color, tenacious in consistency. There was no hemolysis or discoloration of the medium. The maximum size (about 2 mm.) was attained after four days.

Litmus Milk—No acid production or visible change in milk cultures. Smears made after three or four days show only poorly staining, apparently degenerated forms. Milk does not, therefore, appear to be a favorable medium.

Potato—No visible growth.

Hiss-tube Medium (gelatin-agar + 1 per cent. dextrose)—Grows readily along stabs as whitish granular streak, somewhat more diffused near the surface. There is no clouding of the media, and no gas production.

Loffler Coagulated Blood Serum—Growth is not always successful. When it occurs, it appears as a moist, grayish-white confluent surface growth, with a flocculent precipitate in the condensation water. There is no liquefaction of the serum.

Fermentation Reactions—Cultures on sugar-free broth + 1 per cent. saccharose, dextrose, lactose and mannit. There is no growth in the closed arm of the tubes and no gas production. The appearance of the growth in the bulb and bend of the tube is identical with that described in ordinary broth.

Cultures on carbohydrate serum-water media. In *dextrose-serum-water,* there is acid production, visible after forty-eight hours and gradually increasing. The acid produced is not sufficient to cause coagulation of the serum. Acid is also formed in *maltose-serum-water,* but is produced more slowly and in less amount than in dextrose. Saccharose, lactose, mannit, dextrin and inulin are not fermented.

Pathogenicity—The micro-organism is non-pathogenic for guinea-pigs and rabbits.

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A guinea-pig inoculated (November 19) with whole twenty-four-hour blood-agar culture remained alive and well until March 8. It was then chloroformed. No visible lesions were found.

March 4. Three guinea-pigs were inoculated intraperitoneally with saline suspension of forty-eight-hour agar cultures. No local reaction, or evidences of illness. Pig No. 1 inoculated with 5 c.c. of the suspension, was killed after nine days. Careful examination showed no lesions. The remaining pigs have shown no signs of illness, and are still alive.

A rabbit inoculated intraperitoneally on March 4 has remained alive and well (June 13, 1907).

General Considerations.

The systematic classification of the micro-organism here described presents considerable difficulty, and we may say at the outset that we have not encountered in the literature any bacterium which closely resembles the one here studied. If we review its salient characters, we find: (1) pronounced pleomorphism; (2) tendency to the formation of long filaments, usually with terminal bulbous swellings; (3) the presence of a readily demonstrable capsule; (4) false branching, in fluid or semi-solid media; (5) a distinct disposition toward a radial arrangement of the individuals in the tissues; (6) abundant growth upon the usual laboratory media. Negative characteristics, which are of importance in determining the systematic relationships of the micro-organism are: (1) absence of motility; (2) the probable absence of spores; (3) its failure to retain the Gram stain; (4) its strict ærobic growth; (5) its lack of pathogenicity for guinea-pigs and rabbits.

The three groups of bacteria which would come under consideration in discussing the questions of identity are: (1) the pleomorphic bacteria—a loose term taken to include the various acid-fast bacilli, the non-acid fast diphtheria group, the bacillus of glanders, the proteus group, the anærobic *B. necroseos, B. fusiformis,* and other less well-known varieties; (2) the capsulated bacilli, including the Friedländer and ærogenes groups, and (3) the trichomycetes, if we adopt the term which Petruschky[3] has used to include the various Actinomyces, Streptothricæ, Cladothricæ and Leptothricæ. With each of these three groups, the micro-organism which we have studied presents certain obvious affinities, and even more obvious points of difference. The ex-

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treme pleomorphism which it exhibits, and especially the constant occurrence of long filaments, differentiates it from any of the well-known members of the first group, and serves to exclude it without further comparison from the second group of capsule bacteria. Many bacteria may display a certain degree of pleomorphism, especially under unfavorable cultural conditions. With the micro-organism studied, however, this variation in the size and configuration of the individuals is a constant and distinctive character, and on morphological grounds alone is sufficient to differentiate it, for example, from the diphtheria and pseudo-diphtheria group. To the other pleomorphic bacteria above mentioned it has even a fainter resemblance. If we attempt, therefore, for purely descriptive purposes, to group this micro-organism with the pleomorphic bacteria, it must be with the reservation that it departs in many special features from all the known varieties commonly included in the term.

The tendency of this micro-organism to grow in long filamentous forms, to develop terminal clublike swellings, and to exhibit a fairly well-marked radial arrangement in the tissues, suggests certain affinities to the group of *Streptothricæ* and *Actinomyces*. These resemblances, nevertheless, are superficial. There are fundamentally important points of difference. The organism does not retain the Gram stain; it does not form a true mycelium, with terminal aerial spore chains; branching forms are met with only exceptionally, and true branching apparently does not occur. Other important differential characters are the rapid growth on the usual laboratory media, the presence of capsules, the absence of pigment production, and the character of the colonies.

The relationship of our micro-organism to the little studied group of *Leptothricæ* may be very briefly considered. This group is characterized by the formation of long rigid filaments, of uniform calibre, rarely curved or wavy, and exhibiting neither branching, segmentation, nor aerial spore formation. Their mode of development is little understood, since artificial cultures have been successful in but two instances.[5] Besides *Leptothrix buccalis*, found as a normal inhabitant of the mouth, and the closely related or identical species associated with "Mycosis of the pharynx and tonsils," and the well-known Boas-Oppler bacillus, Leptothricæ have been found but a few times in association with pathological processes: in the urine of a tabetic,[5] in a case of vaginitis,[6] and in a gangrenous phlegmon of the lower jaw.[7]

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In 1896 Flexner[8] discovered, in a case of puerperal endometritis in a rabbit, a filamentous bacillus which he cultivated ærobically upon sterile organs, but which did not grow upon the usual laboratory media. To this organism he gave the name *B. pyogenes filiformis* and grouped it provisionally as a Leptothrix. In experimental lesions in rabbits, he obtained a radial or sheaf-like arrangement of the filaments which resembles rather strikingly the arrangement the micro-organisms in the colonies within the aortic vegetations, in our case.

Galli-Vallerio,[9] in smears and broth cultures from subcutaneous tuberculous abscesses in man, found, in conjunction with the tubercle bacillus, a long thread-like organism which decolorized by Gram's method and exhibited false branching. Subcultures were unsuccessful and inoculation experiments negative. A detailed description of this bacterium, classed by the author as a Leptothrix, is not given.

As regards the group relationship of our bacterium to the Leptothricæ, analogies are found only in its filamentous character and in its irregular staining. The occurrence of bulbous terminal enlargements, of false branching, of bent and wavy forms differing from the rigid, straight threads of the leptothrix, differentiate it morphologically from the hitherto described members of the group. Its ready growth on various media seems to us also a differential point of importance notwithstanding the unconfirmed report of Arustamoff,[5] as to the cultivation of his two species.

Without further analysis, therefore, we are led to reject the designation of leptothrix for the micro-organism which we have described.

Under the genus *Cladothrix*, which by Kruse[10] is grouped with the Bacteriaceæ, by Petruschky[3] with the Hyphomycetes (sub-order Trichomycetes), three species have been described: The *C. dichotoma* (Cohn), the *C. ochracea* (Winogradsky), and the *C. intricata* (Russell). These species are obtained from water, are non-pathogenic, and do not grow readily upon laboratory media.

A number of authors, however, have described under the term "Cladothrix" micro-organisms found in necrotic or granulomatous lesions in man or animals, which, upon subsequent examination by more recent workers, have been included under the Streptothricæ. Thus the filamentous organism described by Nocard[11] as *Cladothrix farcinica* (found in the *farcin de bœuf* of Guade-

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loupe) was later shown by Sauvageau and Radais[12] to exhibit true ramification and to be in all probability a true Streptothrix. So also, the *Cladothrix* asteroides found by Eppinger[13] in a brain abscess and in the bronchial and supra-clavicular lymph-nodes, is stated by Kruse[10] to show true branching and to belong rightfully to the Streptothrix group. Rossi-Doria,[14] working with the same strain, came to a similar conclusion. Petruschky also says that "the resemblance to the Streptothricæ is very close." In spite of Eppinger's direct assertion as to the occurrence of false branching, his illustrations certainly do not convey that impression. Whatever may be the proper classification for Eppinger's organism, it is readily differentiated from the one which we have studied by its warty growth on solid media, the production of ochre-colored pigment on old cultures, the reddish growth on potato with the formation of aerial spores and the behavior to Gram's stain.

The filamentous micro-organism isolated by Rosenbach[15] from erysipeloid infections (erythema exudativum multiforme) and described by him as a Cladothrix is classed by Kruse, Lachner-Sandoval, Rossi-Doria, and others as a Streptothrix, and shows no resemblances to the micro-organism here described.

In 1888, Naunyn[16] reported finding in the endocarditic vegetations from a case of chorea, and in the foci of hemorrhagic encephalitis, a branching micro-organism which was identified by Zopf as a Cladothrix or Leptothrix. Unfortunately, the original publication of Naunyn is not accessible, and the abstract in *Baumgarten's Jahresberichten* is too meagre to permit of a comparison between this organism and ours. This is the only case, however, so far as we can ascertain, in which bacteria of this group at all resembling the one found in our case have been encountered in endocarditic processes.

The branching filamentous organism described by Hesse[17] in 1892 under the name *Cladothrix liquefaciens,* should be grouped with the Streptothricæ, so also an organism isolated by Bornhaupt[18] from a case of pseudo-actinomycosis in man, and identified by him with the "*Cladithrix liquefaciens*" of Hesse.

Rullman's[19] organism, probably a Streptothrix, isolated by him from the sputum in a case of pulmonary disease, shows morphological similarities, but differs very distinctly in its pathogenic and cultural characters.

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In spite of the fact that no pathogenic organisms belonging beyond question to the group Cladothrix have as yet been recorded, it seems to us that the micro-organism found in our case answers to the rather ill-defined characters of this group sufficiently to consider its classification, tentatively at least, as a Cladothrix. It fully meets the salient characters of the group, if we accept the classification of Petruscky in Kolle and Wasserman's *Handbuch,* in so far as it exhibits a "false branching (lateral rupture of the sheath with continuation of longitudinal growth in another direction), rapid fragmentation and in consequence a bacillary character in older cultures." On the other hand, the presence of distinct capsules, and the more important fact that no micro-organism belonging with absolute certainty to the Cladothricæ have as yet been found to possess pathogenic significance makes us hesitate to identify the micro-organism which we have described with this group.

Moreover, the limits of this class of trichomycetes are not sharply defined. Although Petruschky somewhat arbitrarily groups the Cladothrix under the Hyphomycetes, and sharply separated them from the higher pleomorphic bacteria, he admits that the phylogenetic relation is a close one. On the other hand, Neumann and Lehmann[20] include the pleomorphic bacteria with the Hyphomycetes. Until a rigid and universally acceptable classification is made, we prefer not to attempt to assign a definite place to the organism studied by us, but to recognize its relationships to the pleomorphic bacteria, on the one hand, and to the Cladothrix group on the other.

To sum up, the micro-organism shows the following features: Long, slender, non-motile bacilli, showing marked pleomorphism; filamentous forms, with distinct segmentation and pseudo-ramifraction; irregular staining, with the presence of metachromatic granules; decolorization by mineral acids and failure to retain the Gram's stain; strict ærobic growth on all the usual laboratory media save potato; no pathogenicity for guinea-pigs and rabbits. The organism was obtained from the blood on two successive occasions, and an organism presenting identical morphology and staining reactions was present in great numbers in smears and sections of the aortic vegetations, but was not isolated in a pure culture. In the sections of the aortic vegetations, the colonies exhibited a definite and striking radial arrangement of the individual organisms.

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We consider the causative relationship of this micro-organism to the production of the vegetative endocarditis to be beyond question, because of its presence in great numbers within the depths of the thrombotic deposits, and because of its presence in pure culture in the circulating blood during life. The general streptococcus infection found at autopsy, we believe to be a terminal condition, since the streptococci were not found during life in spite of repeated blood cultures, and were not present in the depths of the vegetations.

In conclusion, we wish to express our indebtedness to Dr. Norris, director of the laboratory, for his advice and assistance; and to Dr. Jaches, of the Cornell University Medical School, and Mr. E. Glueck, for the photographic illustrations.

REFERENCES.

1. Oertel. Jour. Exp. Med., 1908, 8, p. 103.
2. Lachner-Sandoval. Ueber Strahlenpilze. Inaug. Diss., Leipzig, 1898.
3. Petruschky. "Die Pathogene Trichomyceten," Kolle u. Wassermann, Hdbch. d. path. Mikroorganismen, Jena, 1903.
4. Wright, H. "The Micro-Organism of Actinomycosis," Jour. Med. Res., 1905, 13, p. 349.
5. Arustamoff. Zur Morph. u. Biol. d. Leptothrix, Wratch, 1889.
6. Von Herff. "Ueber Scheidenmykosen," Sammlung klin. Vorträge (neue Folge), 1895, No. 137.
7. Von Arx. Correspondenblz. f. Schweizer Aerzte, 1899, 29, p. 161.
8. Flexner. "The Bacillus Pyogenes Filiformis," etc., Jour. Exp. Med., 1896, 1, p. 211.
9. Galli-Valerio. Centralbl. f. Bakt., Abt. I., 1905, 39, p. 234.
10. Fluegge. Die Mikroorganismen, Leipzig, 1896, p. 190.
11. Nocard. "Le Farcin du Bœuf de Guadeloupe," Ann. de l'Inst. Pasteur, 1888, 2, p. 293.
12. Sauvageau et Radais. Ann. de l'Inst. Pasteur, 1892, 6, p. 292.
13. Eppinger. "Ueber eine neue pathogene Streptothrix," etc., Ziegler's Bieträge z. path. Anat., 1891, 9, p. 287.
14. Rossi-Doria. Ann. de l'Inst. Sper. di Roma, 1891.
15. Rosenbach. Arch f. klin. Chir., 1887, 2, p. 346
16. Naunyn. Mitth. aus d. med. Klin. zu Königsberg, Leipzig, 1888, p. 296. (Abstracted in Baumgarten's Jahresber., 1888, 4, p. 183.)
17. Hesse. Deutsche Zeitschr. für Chir., 34.
18. Kieseritsky und Bornhaupt. Arch für klin. Chir., 1905, 76, p. 835.
19. Rullman. Münch. med. Wchnschr., 1898, 45, p. 919.
20. Lehman and Neumann. Atlas der Mikroorganismen, Munich, 1899.

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ORIGINAL COMMUNICATION.

A CASE OF CHANCRE OF THE FEMALE BREAST.*

By Frank Erdwurm, M. D.,
Voluntary Assistant Pathologist.

(From the Pathological Laboratory of Bellevue Hospital.)

This case is brought before you for two reasons,—first, because of the unusual histological picture presented in the sections, and, secondly, because of the unusual numbers of *Spirochetae pallidae* found in the same tissue by Levaditi's method. The patient's history is of interest:

Mrs. W., aged 34; married 12 years; no children; no miscarriages or previous illnesses of note. About September 1 she noticed on her left breast about 1½ inches below and to the outer side of the nipple a small erosion, which, though not painful, refused to heal, and increased constantly in area.

She came under observation on October 15 (six weeks after she noticed the ulcer). At this time the erosion was about the size of a quarter of a dollar; was covered with a crust, and bled very easily. The surrounding and underlying tissues were firm, not tender, and apparently did not extend into the glandular portion of the breast. The axillary lymph-nodes were enlarged and not tender. The largest node was under the border of the tendon of the pectoralis major, at the anterior axillary line. There was no eruption on the skin, and the throat was normal.

The following day, under cocaine, the outer half of the tumor was excised and placed immediately in 10% formalin.

One week later she developed a general maculo-papular rash of the characteristic color. Mercury was given by inunction, and the erosion promptly healed. At present the thickening of the tissues has largely disappeared, and she shows only the slight scar of the incision.

Naturally, a source of infection was sought for, and her husband, upon question, gave the following history:

In 1891 he had a sore on his penis, which was cauterized, and he was told that it was of no importance. He noticed no further symptoms (rash, etc.), and in 1896, having quite forgotten about it, was married. In 1901 he had swelling of the testicles, which he was told was mumps "gone down."

* Read before the New York Pathological Society, November, 1907.

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In 1902 he was troubled with a scaly eruption on the dorsum of both hands, particularly over the first metacarpal bones. This has persisted until now, being better from time to time, but still never entirely disappearing.

He has had innumerable attacks of sore throat, and his voice is husky now. On examination his lymph-nodes are generally enlarged; he has a scaly eruption on both hands. Behind the left tonsil, or rather between it and the posterior pillar of the fauces, is a fair-sized mucous patch, which undoubtedly was the source of the infection.

The section removed from the breast was carried through acetone and clove-oil celloidin, and stained with haematoxylin-eosin. The histological appearance of the sections was such as to admit of several diagnoses—a diagnosis of chancre being made by but two of eight who saw the sections.

The cutis is everywhere infiltrated with small round cells. There are few leucocytes, and the endothelium of the blood vessels and lymph spaces in many parts of the section show no evidence of proliferation. The papillæ are hypertrophied, and in places dip deeply into the tissue.

In the parts of the cutis furthest removed from the surface, the infiltration consists of large numbers of plasma cells, what appear to be young connective tissue cells or fibroblasts, and a few small round cells.

The diagnosis is so difficult because of the absence of the usual characteristics which accompany primary Sclerosis; namely, perivascular infiltration and the changes in the epithelium lining the blood vessels and lymph spaces.

For confirmation the celloidin block was dissolved out in alcohol and ether, no more tissue being available, and the same block was impregnated with silver nitrate, with the result that innumerable spirocheta pallida can be seen in all parts of the section.

They are seen in the blood vessels and lymph spaces, and in all the cellular structures.

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MENINGOCOCCUS HYDROCEPHALUS.*

By Francis Huber, M. D.,
Visiting Physician, Gouverneur Hospital.

"Hydrocephalus" is not a primary disease. It is the terminal lesion of prior affections leading to an accumulation of serous fluid within the cranial cavity. The pathological condition is frequently, though not necessarily, associated with an enlargement of the head, an important point to remember. Referred to at times as dropsy of the brain or water on the brain, the affection may be acute or chronic, congenital or acquired. The etiology of the congenital cases has not been thoroughly elucidated. In regard to the acquired variety, we shall discuss but one form, the scope of our paper being limited to the consideration of cases complicating or following epidemic cerebrospinal meningitis. Councilman, and other excellent authorities, look upon the original trouble as a meningoencephalitis, rather than a meningitis. The anatomical changes are not confined to the meninges—they may, and often do, involve the superficial layers of the brain and its blood vessels.

The effusion, variable in amount in individual cases, may take place at the onset or at any time during the subsequent course of the disease. Under favorable circumstances it may be absorbed; on the other hand, it may be so extensive as to lead to a fatal issue or influence unfavorably the future mental and physical status of the patient.

The fluid may be limited to one ventricle, though more commonly it is found in both, or it may occur in the subarachnoid space. In other words, we may have an external hydrocephalus, an internal variety, or a combination of the two, external and internal. The treatment of the external form,

* Read by title at the Nineteenth Annual Meeting of the American Pediatric Society, Washington, May 9, 1907.

The paper was prepared about two years ago, but was not presented, as we were awaiting the results of surgical measures resorted to in a series of cases by my colleague, Dr. H. M. Silver. The details of the various operations and the conclusions arrived at will appear later in a special article.

Reprinted from Archives of Pediatrics, 1908, xxv., 161.

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of the combined external and internal, differs materially in principle from that employed or resorted to in the internal or ventricular class.

The symptoms vary with the age of the patient. The head may or may not be enlarged, the increase in size depending upon the condition of the sutures and fontanels. When ossification has taken place the head does not take on the rapid increase characteristic of cases in which the sutures, etc., are still open. The shape of the enlarged head is, furthermore, influenced by the degree and extent of the sutural union.

In the infant with open fontanel and sutures, within one to two weeks from the onset, the tense and bulging anterior fontanel, with diminution and even absence of pulsation in this region, directs early attention to the condition.

The veins of the skull become enlarged and prominent and the various cranial diameters increase more or less rapidly, depending upon the activity of the inflammatory process and the amount of fluid present. The younger the patient, the more pronounced the sutural separation, the larger the fontanel and the greater the general increase in the size of the head.

Though it does not reach the proportions attained in the congenital type, the weight and dimensions may be such that the cranium is no longer supported by the muscles of the neck, but falls to one or other side, or the chin rests against the sternum. It has been said, "the body appears but as an appendage to the large caput" The distended fontanels and widely separated sutures in the extreme cases form a wide-open membranous space, extending forward to the root of the nose, between the separated frontal bone and laterally as far as the temporal bones. The rest of the body suffers from nutritional disturbance and defective innervation. Emaciation associated with loss of muscular power is marked.

In the very young, the bones yield readily to the increase in the internal pressure and the head is uniformly enlarged. In older infants the shape will vary, depending upon the extent of the sutural union and the original conformation of the head. The nonunited portions yield readily and the greatest increase is in the direction of the least resistance. In keeping with this circumstance there may be a greater accumulation

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of fluid in the anterior or posterior cornua of the ventricles and a greater protrusion of the corresponding part of the brain, the more pronounced bulging being found in the frontal or occipital region respectively.

The orbital plates, depressed by the excessive effusion in the anterior cornua, form an obtuse angle with the body of the frontal bone. The position of the eyes is affected, being pushed downward and forward. The sclerotics exposed above, the iris and pupil being partly covered by the lower lid, gives rise to a ghastly expression from under the prominent forehead.

In the posterior basilar type, in addition to the corresponding prominence, there is marked retraction of the head, together with arching backward of the spine. In extreme cases the occiput and sacrum may be in apposition.

It is hardly necessary to say that characteristic nervous symptoms, to be discussed later, are present and form part of the clinical picture.

In cases where the head is normal or but little increased in size (the sutures, etc., having been obliterated before the onset of the original disease) we are compelled, in arriving at a diagnosis, to rely upon the nervous symptoms produced by the effused fluid.

Diagnosis may be more or less difficult.* The clinical manifestations are about as follows: Within a week or two from the onset of the cerebro-spinal meningitis we notice, notwithstanding a rather low or irregular temperature, little or no improvement in the mental condition. The patient remains more or less apathetic or may be comatose. Recurrent vomiting is noticed and occasional convulsions occur. Emaciation takes place rapidly, the abdomen is markedly retracted, the pupils are dilated and the distended veins of the forehead and head become more or less prominent. Strabismus may be present. Stiffness and retraction of the head persist. The temperature is low or subnormal for days and weeks, or is elevated in a very irregular manner.

Wide excursions are also observed. In one of our recent cases a difference of 12 degrees F. was recorded. Paroxysmal

* Koplik teaches that the MacEwen percussion of the skull in children and adults in whom the sutures are ossified will enable one to detect at an early stage a hydrocephalic effusion into the ventricles. He has "found that a percussion of the head following MacEwen's method as to the position of the patient, which should be upright, with the head slightly inclined to one side, the percussion being performed at the pterion, is a most valuable means of discovering the presence of hydrocephalus internus." A hollow tympanitic sound is obtained when fluid is present.

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headaches and a hydrocephalic cry are common; pain in the head and neck may be continuous. Neuralgic pains in various nerve trunks are not uncommon.

In young patients the pulse is rapid; in the older it may be slow, full, intermittent or irregular in rhythm. Incontinence of urine and feces occurs particularly during the relapse. Various forms of muscular paralysis may exist. Muscular tremors of the face, tongue and extremities are frequently observed.

The unfavorable signs clear up now and then. The amelioration in the condition, though striking, unfortunately is too often but a delusive phase in the downward course. Consciousness may be regained, conversation become rational, the general nutrition improve and the sphincters regain their tone.

The general outlook appears to be bright; unexpectedly there is a return of the headache, coma, vomiting, with the other distressing symptoms, followed by a fatal termination in consequence of coma, respiratory failure, exhaustion or convulsions.

A number of exacerbations, with successive relapses, are apt to take place before death occurs.

The so-called cases of "acute dilatation" of the ventricles run their course within one to two weeks and even less; the more chronic may last for months and years.

Acute distention of the ventricles is not infrequent at the outset of the disease. Early in our experience and study of the cases at Gouverneur Hospital in the epidemic of 1904, it was found that, in a number, large amounts of cerebro-spinal liquor, under considerable pressure, would escape when lumbar puncture was performed early. In a few instances, by relieving the pressure, life was unquestionably prolonged or a fatal issue prevented. In the greater number, however, no benefit resulted and the unfavorable course was not retarded.

Deputy Coroner Dr. O. Schultz was impressed, in a series of cases which came to autopsy after an illness of twenty-four to seventy-two hours, by the evident amount of compression of the cortex, apparently due to the increase of fluid in the ventricles.

Treatment—As far as medicines are concerned, excepting possibly the iodides, no very gratifying results have been obtained. In some cases, nature has been kind, the process having been cut short before any great damage was done, and the patient continues to enjoy a fairly comfortable existence.

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A limited number, notwithstanding the existence of hydrocephalus, grow up and show little or no mental change.

It is strange to what an extent the gray matter may tolerate the distention and displacement and yet continue to perform its functions more or less perfectly under the conditions of increased pressure and defective or impaired nutrition. In exceptional cases, where the disease has been arrested, the faculties may continue to develop and in time attain the average. Cases have been recorded of exceptional brightness.

Prof. Von Hauseman, of the University of Berlin, who has recently examined the brain of Theo. Mommsen, the historian, states that he, like Hermann Von Helmholtz, the physiologist, and Adolph Wenzel, the painter, was the subject of hydrocephalus. He suggests that on this basis an explanation may be offered of Mommsen's eccentricity, Wenzel's extreme irritability and occasional fainting fits, and the spasmodic seizures from which Helmholtz suffered (*Medical Record,* May 18, 1907, page 821).

In others, paroxysmal headaches, pains in various parts of the body, inability to engage in mental work, etc., are reminders of the attack. Idiocy, epilepsy, blindness, deafness, various forms of paralysis, etc., make such patients a burden to themselves and their families.

As to operative interference, but two procedures admit of serious consideration. First, lumbar puncture. Under aseptic precautions and with the necessary experience, Quincke's lumbar puncture is a comparatively simple and safe measure. The best results are obtained in cases in which the effusion is limited to the subarachnoid space; in other words, in cases of serous meningitis or external hydrocephalus. Schultz, of the Posen City Hospital, reports that he has found that the intellect is cleared, the appetite improved, cramps disappear and the sleeplessness and vomiting are arrested after lumbar puncture in the hydrocephalic stage of cerebro-spinal meningitis (*New York Medical Journal,* June 15, 1907, page 1,136).

Such excellent results are exceptional in the experience of those of us who have studied the epidemic in New York.

Now and then a single lumbar puncture is followed by marked and rapid improvement in the symptoms. Whether this is a simple coincidence or a brilliant therapeutic result accomplished by intervention at the proper moment it is impossible to say.

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I do not know of any sign or series of symptoms, a consideration of which will enable the observer to select this auspicious moment or predict the results in any case of lumbar puncture.

In the combined external and internal variety, lumbar puncture must be repeated at varying intervals whenever convulsions, paroxysmal headache, recurrent vomiting spells, increased apathy, etc., point to increased intracranial pressure. In some of our cases lumbar puncture was resorted to fifteen to twenty times; the highest amount withdrawn at one time was 85 c.c. Finally a "dry tap" may be noted. Fluid is not found, as the channels of communication between the ventricles and the arachnoid space have been obliterated or the structures at the base of the brain have become so adherent as to prevent the escape of fluid from the ventricles to the subarachnoid space. The pathological conditions have, therefore, transformed the case into the ventricular variety or internal hydrocephalus.

In cases in which, in addition to the effusion, there are marked evidences of cortical changes (maniacal attacks, epilepsy, paralysis, etc.), though we may remove the fluid we cannot restore the integrity of the nervous structures. Cushing's operation of draining the fluid into the retroperitoneal connective tissues has been performed a number of times, without any ultimate success, in the combined external and internal types.

Finally, we come to the internal type—ventricular dropsy or chronic internal hydrocephalus in which the foramina between the ventricles and subarachnoid space have been closed by inflammatory processes. Lumbar puncture is of no avail in this variety, and we are consequently forced to resort to ventricular drainage, a surgical measure employed by my colleague, Dr. H. M. Silver, in a series of cases in the Beth Israel Hospital. In only one of the patients operated upon did we get any encouraging results. In a few, though life was unquestionably prolonged, the mental state did not present a corresponding degree of improvement.

Notwithstanding the unfavorable and poor results obtained in our cases, all late and progressively growing worse, the operative procedures ought not to be condemned prematurely, nor should they be considered in the category of "sins which, committed aseptically, are readily forgiven." We are dealing with a most unfortunate pathological condition. The various operations thus far devised and resorted to in advanced cases offer, it is true, but slight hope of cure. Perhaps an earlier diagnosis and an earlier resort to surgery, in selected cases, may give better results.

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A CASE OF UNIVERSAL FETAL HYDROPS.*

By Alwin M. Pappenheimer, M. D., *Pathologist.*

(From the Pathological Laboratory of Bellevue Hospital.)

Hydrops fetus universalis is defined by Ballantyne in his book on Fetal Pathology as a "rare condition characterized by general anasarca, by the presence of fluid effusions in the peritoneal, pleural and pericardial sacs, and usually by oedema of the placenta; and resulting in the death of the fetus or infant before, during, or immediately after birth." Isolated cases have been described from the time of Hippocrates, but Ballantyne in 1900 was able to collect in all only seventy odd cases from the literature.

The specimen which we have to present was obtained through the kindness of Dr. Max Schott, who sent the fetus to the laboratory for diagnosis, and supplied us with a clinical history.

The mother was 26 years old—a primipara. Her parents were living and well, and there was no personal or hereditary history of syphilis. Her last menstruation was in February of this year. Pregnancy appeared to be normal, and she was free from unusual symptoms of any sort until the middle of the sixth month, when it was noticed that her abdomen *suddenly* became very much larger, and she developed oedema of the feet. She also complained of extreme thirst, and consumed large quantities of water. The urine was free from albumen or sugar.

On the morning of September 14, *i. e.*, about the beginning of the seventh month of gestation, the bag of water suddenly broke. Labor pains did not set in until later in the afternoon. Dr. Schott was called in the evening and found the external os almost dilated, but was puzzled by the peculiar shape and doughy consistency of the presenting part. The second stage progressed slowly but normally, until the head appeared at the vulva. "Then," to quote Dr. Schott, "I tried to aid its passage with my right forefinger by way of the rectum, but this slight effort on my part was sufficient to sever the head from the trunk; it tore off and fell out. In a similar manner, the arm separated from the shoulder when I hooked my finger into it in order to exert some traction on the body." Strong pains continued, and the rest of the body was expelled without difficulty. The placenta, when expressed, was found to be unusually large, irregular, friable and oedematous.

The puerperium was rapid and uneventful; the only feature of note was the serous character and copiousness of the lochial discharge.

* Presented before the N. Y. Pathological Society; see Proceedings, New Series, Vol. vii., Nos. 5 to 8, October, 1907, to January, 1908 (October meeting).

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The fetus presented a really remarkable appearance. The preserved specimens fail to convey an adequate idea of it, and a photograph taken before the fetus was dissected, unfortunately, was unsuccessful.

The general dropsy in this case is extreme. The features were swollen and distorted; the eyes were closed; there were deep grooves at the root of the nose and between the mouth and cheeks, and, indeed, the livid, puffy face curiously resembled, on a small scale, that of a morgue "floater."

The subcutaneous tissues everywhere were distended with serum, the dorsum of the hands and feet and the labia were perhaps the most oedematous regions. Wherever the skin was incised, fluid exuded freely. The serous cavities, thoracic, pericardial and peritoneal, were likewise filled with clear, yellowish fluid of low specific gravity. The lungs were entirely unaerated and pressed against the vertebral column.

Aside from this general water-logged condition, no gross lesions or anomalies were discovered. The adrenals and kidneys appeared rather small for the size of the fetus, but save for a moderate pallor, were in no wise abnormal. The liver and spleen were very friable, but not otherwise remarkable. The intestines contained meconium, the mesentery was short. Thyroid, thymus, pancreas, bladder and the other viscera appeared entirely normal.

The microscopic sections have not been of much assistance in revealing a cause for the condition. The kidneys show no clear evidence of nephritis, although there appears to be more than the normal number of leucocytes and round cells in the interstitial tissue. In the skin, the cutis consists of an oedematous embryonic connective tissue, with numerous collagenous fibrils forming a loose meshwork. Capillaries are abundant, and there are plenty of developing sweat ducts. Fat cells are few and poorly developed. The papillae are rudimentary. The elastic fibres are present, but stain very faintly and show no regular disposition. The thyroid contains no colloid, and the cells are heaped up in the alveoli. The thymus is normal. Although our study is very incomplete as yet, it is hardly likely that a more careful examination of the tissues will disclose a cause for this obscure and interesting condition.

It may therefore be worth while to summarize very shortly the few clinical and pathological facts that are known. The etiology appears to rest entirely upon speculation. Maternal nephritis with dropsy has been present in a few of the cases, but is so frequent an accompaniment of pregnancy, and fetal dropsy so rare an outcome, that no serous importance can be ascribed to their coincidence. Careful microscopical examinations of the fetal organs have been recorded in but nine cases (Ballantyne). The majority of these showed little indisputable evidence of nephritis, although in two of the cases, there was complete cystic degeneration. The placental findings are inconstant, and may well be secondary. Some of the recorded cases have shown cardiac anomalies—stenosis of the pulmonary osteum, defective septa, or premature clo-

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sure of the foramen ovale—and the attempt has been made to explain the general hydrops upon purely mechanical grounds. As many of the cases, however, have shown normal hearts, and conversely as these congenital cardiac defects frequently occur without oedema, the causative relationship is not clear.

Microscopic examination in several of the cases has shown a stagnation of the leucocytes in the liver, spleen and marrow, and the sections from the liver in our case show a similar condition. This has been interpreted by Sänger as a leukæmic infiltration, and the disease regarded by him as a sort of fetal spleno-myelogenous leukæmia. Even if this were a constant finding, it would scarcely explain the hydrops. The cause for the hydrops, therefore, is still undiscovered. The dropsical infants are born oftenest to women over thirty, and very rarely, as in our case, to primipanæ. There appears to be a tendency for the condition to recur in later pregnancies. Polyhydranios is the rule, a few of the labors are recorded as dry. The fetus, if born alive, dies within a few hours; often, because of the friability of the tissues, it is badly injured during delivery.

The danger to the mother appears to be slight, aside from the increased mechanical obstacle to labor. A successful convalescence is the rule.

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POSTDELIRIOUS ALCOHOLIC STUPOR (ALCOHOLIC CEREBRAL ŒDEMA, "WET BRAIN.")

By Charles K. Stillman, M. D.,
Voluntary Assistant, Pathological Laboratory.

The peculiar stupor that sometimes follows alcoholic delirium has been little studied and less frequently described. In this country it has received attention from scarcely anybody except Dana* and Lambert,† and although occasionally met with in private practice, is generally unrecognized by the profession at large.

Of late there has been manifested an increased desire for information upon this subject, but the difficulty of obtaining a sufficient number of cases for comparative study has operated against the fulfillment of this desire.

This article, while not pretending to solve the many pathological problems involved, nor to answer in sweeping statements all clinical questions that may be asked, nevertheless represents a certain amount of first hand study under fairly favorable conditions and should have a certain value, if for no other reason than that its rather limited series of cases and observations may serve as a basis of comparison for more complete investigations.

The association of stupor with œdema of the meninges has led many in the past to regard the transudate as the central, if not the causative, factor in this interesting postdelirious state, yet it seems an indisputable truth that the symptoms accompanying are merely those of a certain type of cerebral irritability, for they not infrequently occur in conditions where no traces of œdema are found at autopsy. Thus, in the low muttering delirium of typhoid fever and in the last stages of chronic uræmia is often seen a clinical picture closely resembling alcoholic postdelirious stupor. There are the same evidences of muscular unrest, the same vacuous facial expression, the same pupillary changes, the same hyperæsthesias—all pointing to some profound irritative

* Dana, Textbook of Nervous Diseases.
† Alex. Lambert on Alcoholism, Osler's Modern Medicine, I.
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influence acting upon brain tissue, but œdema of the meninges is not always present in the non-alcoholic cases.

It is worthy of note that these cases are in a low physical state and suffering from cerebral toxæmia.

Conversely, it is interesting to note that considerable degrees of serous effusion of the meninges are found post-mortem in cases that during life have given no special symptoms referable to this condition.

The presence or absence of the œdema apparently has little to do in the production of the clinical picture, yet it occurs with surprising regularity in the alcoholic cases; its causation had probably better be looked for among the general conditions underlying the stupor.

The occurrence of marked œdema of the meninges in advanced alcoholics has been generally recognized by pathologists the world over. It may be conceived as beginning in a small way in the simple chronic alcoholic, and rising with successive degrees of intensity throughout the various stages of alcoholism to culminate at last in that condition of which its own presence pathologically is the most striking feature.

It is a matter of a good deal of difficulty to arrive at any just estimate of the causes that contribute to the production of the stupor. Perhaps in view of the undeveloped condition of our knowledge along these lines it may be as well not to theorize at all, but merely to lay emphasis on the probability of a toxic factor and to point out the symptomatic resemblances of this condition to others in which toxæmia and exhaustion undoubtedly play a large part.

The type usually considered in speaking of "alcoholic wet brain" is a transudate pure and simple, and not included under the category of the low grade meningitides. However, there is in alcoholic œdema a tendency to low grade inflammatory changes about the blood vessels and meninges that is far more marked than in wet brain of other types. Transudation takes place from the piaarachnoid and occasionally from the small blood vessels penetrating the brain substance. About these latter a small watery zone may sometimes be made out. The changes in the brain substance and meninges are those so often described under chronic alcoholism.

The pathologist should not be too ready to diagnosticate wet brain in cases where the œdema may well have been post-mortem.

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In true œdema the effusion will be found well distributed, whereas in post-mortem œdema the fluid will be found only in the dependent areas.

Ætiology—At the very outset it seems well to lay emphasis on the fact that the symptoms of this type of stupor are almost invariably preceded by a greater or less degree of alcoholic delirium. Dr. Lambert records a few cases where preceding delirium was not noticed, but in the vast majority of instances the previous statement will undoubtedly hold true. The finest examples, naturally, are those in which the symptoms develop following a simple delirium, and it is of these that this paper treats. A second class, in which the wet brain develops following a delirium tremens brought on by pneumonia or some other acute condition, should be worthy of a separate article.

A study of ninety-eight patients admitted to the male and female alcoholic wards of Bellevue Hospital shows some rather interesting results.

From September 1, 1905, to September 1, 1906, there were admitted to the female alcoholic wards of the hospital 2,133 patients; of these but twenty-two were attacked with wet brain, which, after deducting a relatively small number of non-alcoholics from the general total, represents a percentage of approximately 1.

Nationality—Irish, 10; American, 8; English, 2; Canadian, 1; Scotch, 1.

Age—The youngest was 23 years of age, the oldest 60, while the majority ran variously between 30 and 40. There were three between 50 and 60.

Mortality—Of the twenty-two patients, eighteen died, a mortality of approximately 81 per cent.

Duration—Among those patients who died, the duration of life in uncomplicated cases ranged from one to forty-five days. Of these the three of longest duration, *i. e.*, twenty-four, twenty-nine and forty-five days respectively, died apparently of exhaustion. Nine other patients, the balance of the uncomplicated cases, ran variously from two to nine days.

Of the complicated cases where the patients died, the durations were variable. Two contracted lobar pneumonia, one had lobar pneumonia and morphinism, another was attacked with broncho-pneumonia. One died with symptoms of post-delirious

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stupor and pulmonary tuberculosis, but, as there was no autopsy in this case, the diagnosis might well have been tuberculous meningitis.

Of those patients that "recovered," one was taken home unimproved after twenty-eight days. Two were sent to the Department of Public Charities as improved, after sixteen and eighty-nine days respectively, and a third was completely cured after ninety-four days. This young woman, 34 years old, now strong and healthy, presented the condition in its most aggravated form.

During the same period, that is, from September 1, 1905, to September 1, 1906, there were 5,017 admissions to the male alcoholic ward. Among this number, seventy-six were attacked with symptoms of post-delirious stupor, or approximately 1.5 per cent. After deducting a small fraction for non-alcoholic admissions, we note that there is still a relative preponderance of the condition among the males.

Nationality—Irish, 24; American, 30; German, 6; English, 3; Swedish, 3; French, 1; Italian, 1; Scotch, 1; Bohemian, 1; Hebrew, 1.

Age—The oldest was 72 years of age, three were between 60 and 70, fourteen between 50 and 60, twenty-three between 30 and 40, and four between 22 and 30. Ages of eight others unknown.

Mortality—Of the seventy-six, sixty-three died, a mortality of 79 per cent.

Duration of Illness—Among those that died, in the uncomplicated cases, the duration was from less than one day to twenty-two days. The average duration was a trifle under a week, but this does not give a correct idea of the condition. As a matter of fact, out of forty-eight uncomplicated cases, only fourteen patients were over nine days in duration, the longest being twenty-two, twenty-one, seventeen and fifteen respectively. But twelve were between five and nine days in duration, while the greatest number (twenty-two) was less than five days in duration.

When it is considered that these figures in many instances represent a considerable portion of the preceding active delirium as well, a still further reduction must be allowed for.

Of the complicated cases where the patients died, six succumbed to lobar and three to broncho-pneumonia, either coincident or complicating; of these none lived longer than twelve days. One died of decubital gangrene on the fifteenth day, and two who were suffering with simple fractures of the femur on ad-

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mission died after about a week. In a case with a fractured tibia, the patient survived twelve days.

The thirteen patients who recovered did so in periods of from two to forty-five days. Five of these were of long duration, nineteen, twenty-eight, thirty-four, thirty-nine and forty days respectively; eight recovered in periods of from two to thirteen days.

The individual mentioned before who recovered in thirty-nine days exhibited remarkable vitality, as he had two fractured ribs on admission, and was attacked with pneumonia while in the ward. The patient who was discharged after forty days, together with one other where œdema was of slightly shorter duration, was committed shortly after as insane.

Of the others, two were sent to the Department of Public Charities as improved, while the remainder were actual or apparent cures.

Summary—In studying statistics, particularly of a small series like the one I have given, great care should be taken not to be led into erroneous conclusions. However, a number of very interesting points are apparent.

It would probably be unfair to cite the slight relative preponderance in males as conclusive, owing to the rather limited number of cases studied. The mortality figures for either sex are not far enough apart to suggest that one sex succumbs more readily than another. Dr. Lambert's records give a considerably lower mortality than these figures would indicate, and I am inclined to believe that the final figures will be found considerably below rather than above the 80 per cent. mark.

The relatively earlier age at which females are subject is borne out also by Dr. Lambert's figures. But there is one peculiar difference that is perhaps a direct consequence of the drinking habits of the two sexes. Men unquestionably survive the shorter attacks better than women, while they succumb with greater frequency to the longer ones. The majority of drinking men punctuate their steady tippling with occasional debauches, which probably have a tendency to bring on delirium tremens earlier than it would have occurred if their efforts had been less spasmodic in character. As a result the attack is more acute but less fatal, because precipitated before their vital powers are entirely used up.

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Women, on the other hand, tipple steadily, but debauch less, and this, together with their more sheltered life, staves off the delirium until it results as a direct sequence of physical exhaustion. On these stupor descends with terrible effect, for their vital processes are very low, and resistance almost nil.

In this connection I should like to state that I have seen in men many cases which for lack of a better term I will call *transitory wet brain,* in which the symptoms, manifesting themselves for only a few hours or during the night, almost escape notice. In the majority of cases these have occurred in delirium during a pneumonia, although occasionally in the simple non-complicated form.

The most interesting feature of these statistics is the tendency which they show toward a separation into two distinct types, the short and the protracted. The short considerably outnumber the protracted. Women, by the way, who last long enough to become protracted cases, show remarkable powers of resistance.

Symptomatology—There is no set rule as to the time of onset of stupor in the course of delirium tremens. When the delirium tremens complicates pneumonia, the period of greatest susceptibility is about the crisis, but in general it may be set down that "wet brain" is likely to make itself manifest at about the third or fourth day of delirium tremens, and so insidious and stealthy is its approach that it is hard to determine where one condition terminates and the other begins.

Perhaps the first symptom to attract the physician's attention is the distinct alteration in facial expression. The marked restlessness and noisy activity that characterized the delirium tremens have departed, and his heightened color and exaggerated play of expression have given place to a gray pallor and almost cadaveric immobility of countenance. At this time the pupils are observed to be equally contracted, and there is a moderate degree of stiff neck present. Soon the picture becomes more complete, as the characteristic symptoms unfold themselves. Usually the patient lies flat upon the back with legs extended, head thrown slightly back and unobserving glance directed toward the ceiling, toward which the hands reach in a rather characteristic manner, suggestive of rope climbing. They are seldom still for more than a few seconds at a time, and exhibit the weak, wide tremor of cerebral irritation. The facial expression, aside from its gray pallor, is rather distinctive, and unique in the almost total obliteration of

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the lines of expression. Dr. Gregory mentions the following points as especially indicative of wet brain: "Line of thought sharply accentuated, yet face totally devoid of expression. Eyes dead, fishy and lack lustre. Mumbling mouthing articulation in contradistinction to the muttering of other low deliriums in which the spoken words are more sharply defined and clear cut."

Generally the stuporous patients say nothing that is audible. When they talk, as some of the milder cases do, the *labials* are absent, and they appear to suffer from inability to initiate muscular movements of the lips. When irritated or hurt, the accompanying facial contortion involves the least mobility of expression consistent with the recognition of pain. In the majority the eyelids are closed, while flies gather in numbers unheeded about the eyes, nostrils, and corners of the mouth. The pupils in the early stages are often reduced to pin point size and later dilate, remaining so to the end, but this is by no means the invariable rule. Some patients exhibit no pupillary changes whatever, while in one, a case observed in ward 6 in March, 1906, they underwent frequent alterations in size. At times it was even possible to see the slow reactionary changes taking place.

Two, rather constant, early symptoms are muscular rigidity, which is seldom extreme, and hyperæsthesia, the latter particularly marked when circulation to any part is cut off. In time both these symptoms are likely to attract little attention.

Stiff neck, however, is very persistent. In women the writer has many times noticed an ulnar deflection of the fingers, but it is quite possible that this may have been due to the multiple neuritis, so common in alcoholics.

The pulse maintains much the same general features throughout, being small, frequent, feeble, intermittent, of low tension, and very variable in its quality and rate from hour to hour and day to day; indeed, it may run 90 to 100 one hour and 120 to 130 the next, the general average being somewhere between these two figures.

Respirations, on the other hand, are not much disturbed.

Temperature is typically low, 99 to 101 degrees F., and not seldom it drops to subnormal—in general a low, irregular temperature curve.

The stupor is typically a quiet one, except for the muttering movements of the mouth, and the peculiar and continual activity of the hands.

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The coma is a very variable quantity; certain cases never become comatose until just before death, when, according to Dana, the filling of the ventricles induces this result. Cases of this sort may remain perfectly rational, talking in mouthy articulation or answering questions until the last.

A second class, passively delirious or comatose, will comprehend if directly addressed, or even obey directions, but relapse with closed eyes into incoherent muttering, if left alone.

A third class remain oblivious to all external stimuli.

As to the course of the illness, there is nothing very definite in the patient's symptoms on which to base a prognosis; perhaps all that can be safely said on this subject is that the cases of short duration greatly outnumber the protracted ones, but do not differ from them so far as the clinical picture is concerned, except in the matter of muscular wasting.

The hold on life which some of the protracted cases seem to have is nothing short of astounding. Under intelligent care they worry along indefinitely, with occasional periods in which life seems completely to be despaired of, periods of weakness and constitutional depression alternating with periods of comparative lucidity and apparent gain in strength until the disease reaches a definite termination.

It is interesting and worthy of note that in these cases gain in strength is sometimes the signal for a new outburst of delirium.

The termination is by death in the majority of all cases. Our investigations, already quoted, placed the mortality at 81 per cent. in females and about 79 per cent. in males.

Exhaustion determines the end of many, while a large number die of complicating pneumonias, both lobar and broncho, and bedsores, the latter a most alarming complication, owing to the patient's almost negative vitality and lowered bodily resistance.

Of those that outlast the œdema, a certain proportion develop permanent insanity, while others, actually cured, suffer for a time from mental or bodily enfeeblement.

Diagnosis—This is by no means so simple a matter as might at first glance seem evident; unless directly following an attack of delirium tremens, the physician should hesitate about committing himself.

The writer was once so far led astray by appearances as to diagnosticate a case of pernicious malarial fever with meningeal involvement as "wet brain," the picture for a few hours being

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identically similar. It is well to remember that any condition where there is cerebral œdema, or any condition in which cortical irritability is the same in degree as in wet brain, may produce a picture that will puzzle the expert. Perhaps the most fruitful source of error among those who have charge of the alcoholic service is tuberculous meningitis, which, while a classic picture in children, may assume in adults more protean forms than almost any disease except syphilis.

I know personally of three successive cases of tuberculous meningitis which came to the alcoholic wards and were diagnosticated "wet brain" by competent and experienced men, who discovered their mistake only at the autopsy table.

In general, it cannot be diagnosticated from tuberculous meningitis in atypical form, except by the presence of a preceding delirium or through finding tubercle bacilli in the fluid drawn off by spinal puncture.

Paretics compensate partially for the reduction in size of their brain tissue by effusion of fluid into the unoccupied cranial space giving rise to a pathological condition in many respects similar to that in alcoholic wet brain. They, however, die rather typically by going into a convulsion, with subsequent coma, a terminal event which I have never seen in a simple alcoholic.

Treatment—Possibly better results are obtained from a system of forced feeding, combined with judicious stimulation, than through any other course.

The whole problem seems to be largely one of vitality and elimination, and happily the stomach accepts large amounts of nourishment and medicine without protest. Unfortunately, it is unlikely that much of this is converted into tissue, owing to the depressed condition of the body functions.

Enormous amounts of food are required, including eggs, egg noggs, liquid peptonoids, and broths, together with powerful stimulation, when the pulse flags and the vital processes get low. The patients do not react to normal stimulating doses; it is surprising to see how much stimulation they can take care of with apparent benefit. The writer has frequently used

℞ Whiskey .....½ oz.;
Camphor .....gr. iii.;
Strychnine .....gr. 1/30.
M.

every three hours for considerable periods, with fairly gratifying results.

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Of all the drugs, caffeine is perhaps the most suitable for this class of cases; it may be given as citrated caffeine in five-grain doses, or, if so desired, as the sodium benzoate in similar amount.

Very good effects are reported as a result of sitting patients up in bed; it is said to lessen the œdema. Dr. J. D. Peters, late house physician of the first division, reports considerable success with this method.

Tapping the cord produces results for a short time, say a day or so. The relief of pressure or the change in circulation incident to the removal of the fluid seems to cause a temporary accession of energy, so that a stuporous case may rouse up and assume for a short time the active movements and facies of an earlier stage of the disease. Indeed, there is not infrequently a resumption of active delirium until the fluid reaccumulates.

No permanent results are noted. The fluid removed is usually in increased amount and under increased pressure. Otherwise, it differs in no respect from normal fluid either in appearance or in the distinctive count.

* * * * * * * * *

For criticism and valuable suggestions the writer would like to thank Dr. Charles Norris and Dr. A. M. Pappenheimer, of the Pathological Laboratory at Bellevue; Dr. Alexander Lambert; also Dr. J. D. Peters, Dr. J. H. Cudmore, of the medical staff, and Dr. Paul Waterman, late of the psychopathic department, Bellevue Hospital, as well as the many others whose valuable experiences and observations have added to the material of this paper.

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A CASE OF ACROMEGALIA.

By Charles Norris, M. D.

(From the Pathological Laboratory of Bellevue Hospital.)

The case of acromegaly which I am about to present occurred in a patient, German by birth, who entered Bellevue Hospital in December, 1902, in the service of Dr. Frank W. Jackson, and who died four years later (January, 1907), also in Dr. Jackson's service. I take this opportunity to acknowledge publicly my thanks to Dr. Jackson for his courtesy and kindness in permitting me to report upon the clinical history of the case.

The man was single, a driver by occupation, and, when admitted to the hospital, was 33 years old. He gave the following history:

Six months previously he was told that his face and hands were growing larger. At this time he began to have dizzy spells. Things became black before his eyes at times. His memory also became poor. His feet became so much larger, according to his statement, that he had to buy larger shoes. At this time he went to St. Francis Hospital, where he remained until two months before admission to Bellevue.

After his discharge from St. Francis he was unable to work on account of frequent dizziness and sharp, radiating headaches. His tongue became enlarged, and impaired his speech somewhat. He became clumsy with his hands, and his gait was a little uncertain. He complained of indefinite pains in his arms. No other important symptoms were elicited, his chief complaint being attacks of dizziness, and severe headaches.

Family and personal history were negative. He had never been ill before, save for a slight attack of bronchitis nine months previous to admission.

On admission he was fairly well nourished, and rather anemic; muscles flabby; poor muscular power; lips thick; eyes prominent, lids heavy; nose large and prominent; lower jaw projected slightly, although teeth met; eyes reacted normally to light, and accommodation; tongue somewhat enlarged, moist and tremulous.

Thyroid Gland—Normal to palpation, and apparently not enlarged. Pulse was rapid, 110.

Heart—Normal; no murmurs.

Lungs—Normal.

Abdominal Examination—Negative.

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Hands showed general enlargement, involving bones and soft tissues; nails were normal. Feet were enlarged, principally the great toes. Reflexes remarkably diminished. Blood examination showed a hypoleucocytosis, 3,400, and rather marked secondary anemia. Hemoglobin 60%. Urine was clear, acid, and contained no albumin, sugar or casts.

From the time of his admission, patient complained of dimness of vision, and severe frontal headaches. Two weeks after admission, opthalmoscopic examination was made by Dr. Reese, who reported: "Receding choked disc of both eyes. Veins and arteries very tortuous. Nerve margins blurred. Left nerve is atrophic, while right nerve shows beginning atrophy. Pupils react to light directly and consensually."

In January, 1903, without premonition, he was taken suddenly with an epileptic convulsion, lasting five minutes. General muscular spasms, with cyanosis, frothing at the mouth, and dilated pupils. The attack was followed by prolonged stupor. No recollection of convulsions upon regaining consciousness. Six months later he had a second convulsion, and from this time until his death they recurred, gradually, and at decreasing intervals, toward the end, several times a week, and on some days, several convulsive attacks occurred. They were never preceded by definite auræ, nor were there at any time localized spasms which might point to a focal lesion. It may be said, however, that the attacks were usually preceded by more intense headache than usual. The headaches, usually frontal, were a persistent and distressing symptom, present the greater part of the time, and but partially relieved by drugs. The visual disturbance was progressive. During the last few months amaurosis was complete in both eyes. On May 19, 1903, in other words, about one year from the onset of the first symptoms, there was noted "neuritic atrophy of the left optic nerve, with no vision. Right eye has 20—20, with + 2.5 diopters spherical. Both nerve heads are filled with cicatricial tissue, margins much blurred. Field in right eye for form is normal, but for red, concentrically contracted."

There was a distinct deterioration of the mental faculties, evidenced by progressive loss of memory for recent events, and by fits of irritability. Other evidence of psychic impairment was never observed.

The nutrition of the patient was well preserved, and the weight remained approximately constant, 194 to 206 pounds. Digestion and appetite were excellent. No attacks of vomiting of the cerebral type were ever present.

Urine—From his admission in 1902—until May, 1905—in other words, for the first three years of his disease the usual clinical examination showed no abnormalities, save the occasional presence of a few hyalin casts. From this date in all subsequent examinations glucose was present in amounts varying from a trace to 224 grams in twenty-four hours. The specific gravity ranged from 1.028 to 1.034, averaging about 1.034. Total twenty-four hour amount never exceeded four litres. No examination for acetone or diacetic acid is recorded. For a time in the fall of 1903 and the spring of 1904 the patient received Parke Davis's pituitary extract without obvious benefit, although the patient said that he felt better.

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During life the patient had a marked stooping carriage. Death occurred on January 19. Patient had had a series of severe convulsions, followed by coma and Cheyne-Stokes respiration.

Summary of Clinical History—Total duration of illness, June, 1902, to January, 1907, four and a half years.

Principal Symptoms: Progressive enlargement of jaw, nose, ears, hands and feet. Persistent frontal headaches and attacks of vertigo. Gradually increasing loss of vision, ending in double optic nerve atrophy and practically complete blindness. Recurrent epileptiform attacks. Glycosuria for twenty-two months.

For the present purpose, only the significant features of the post-mortem findings need be given.

The body was that of a large, well-developed and well-nourished male, about 90.9 kilos in weight. Length of body on table, 5 ft. 8¼ inches.

The general appearance of the face was not as striking as it was during life; the lower jaw did not appear as large and prominent. The nose, however, was large and long. Lips were somewhat thickened. Teeth and gums were normal. The ears were markedly hypertrophied and symmetrical. This difference in appearance at autopsy was due, it seems to me, to the characteristic posture of the patient during life, his lower jaw thrown forward, his head lowered, and marked stooping carriage. In other words, the kyphosis that was so prominent a feature in life was a physiological one, since the vertebral column at autopsy was found perfectly straight. Although the forehead was receding, the supraorbital ridges were only slightly prominent. The skull was brachycephalic, 22½ inches, "sub-occiptobregmatic." The eyes protruded markedly, even at autopsy. Chest was long and broad, the lower opening being especially wide. The sternum was not enlarged. The costal cartilages were broad, the fourth left, in its broadest portion, being 25 mm., in its narrowest, 20 mm. The ribs, although at autopsy they appeared to be broad and heavy, may be said to be only slightly larger than normal, corresponding in size to those of a man of the patient's size.

Circumference of chest, 38¾ inches. From tip to tip of acromion process, 18 inches. Glove measurement, 8½ inches. Across fingers, 8 inches. Middle finger, 4½ inches. Foot measurement around metacarpal joint, 9½ inches. Circumference of big toe, 4 inches. From these measurements it can be readily seen that the feet and hands were not greatly enlarged. Neither were the subcutaneous tissue and skin hypertrophied. Enlarge-

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ment of both big toes, however, was a striking feature. No osteophytes were felt.

The small toes were likewise greatly enlarged. The fingers were large and sausage shaped. The nails were broad, but otherwise normal. The subcutaneous tissues of the toes and fingers were hypertrophied. The corium taken from the abdominal wall was hypertrophied.

To be brief, it may be said that the viscera were practically normal, with the exceptions to be noted. Considering the size of the body, it may be safely asserted that the so-called condition of splanchnomegalia was not present.

Heart—Normal. Weighed 473 grams—normal to the body weight.

Liver—Weighed 2,930 grams, being slightly below weight in proportion to that of the body.

Spleen—Weighed 510 grams, being almost double in weight. The capsule was wrinkled.

Kidneys—Together weighed 360 grams. Normal relation to body weight.

Pancreas—Length 20 cm.; large; weighed 170 grams, in relation to the body weight one-sixth above normal. The organ was firm, the lobulations being distinct. No macroscopic lesions were noted. The organ underwent rapid post-mortem softening.

Thymus—Was persistent, and extended to the auriculoventricular junction below, and to the thyroid gland above. The left lobe was somewhat larger than the right, and very broad. Weight of gland was 70 grams.

Tongue—Was very large and broad, measuring from apex of tongue to apex of circumvallate papillae, 11 cm. Maximum breadth, 7 cm. The papillae were extremely large. Lingual tonsils were large. In the pyriform fossæ of the larynx, on the anterior surface of the epiglottis, numerous small, raised, grayish bodies, averaging 4 to 5 mm. in diameter, were present.

Thyroid—Thyroid cartilages showed reddish bone-marrow. Thyroid gland was symmetrical, normal in size and appearance. The cervical lymph nodes were somewhat increased in size, and slightly yellowish in color. The lymph nodes of other regions were normal in size. The only lymphatic hyperplasia that was noted was found in the larynx and pharynx, the splenic follicles not being hyperplastic.

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Gastrointestinal Tract—Stomach, moderate *état mamelonné* in pyloric region. Otherwise the gastrointestinal tract was normal.

The genitourinary tract was normal, the penis and testicles being well developed.

The cranium may be said to have been normal to the size of the body. The bones of the face, with the exception of the inferior maxillæ, were not enlarged. The scalp tissues were normal. On stripping the scalp from the calvarium, the parietal bones were found markedly hyperemic. Bones of the skull were soft, being readily sawn. The temporal bones were thin, only 2 to 3 mm. in thickness.

Over the right frontal base the bone measured 9.5 mm. Here the diploe was extremely hyperemic, 4 mm. in thickness. Outer table measures 3 mm., inner table 2 mm. Dura presents over both cerebral convexities a number of flat, whitish chalky plaques, the largest 5 to 6 mm. in length. The pia shows no opacities. The cerebral convolutions over the convexities are markedly flattened, the sulci being almost obliterated.

On lifting the frontal lobes a tumor mass was found on the inferior surface of the right frontal lobe. Owing to the apparent attachment of the tumor to the pituitary gland the brain was removed with sella turcica, and adjacent parts of the base of the brain. The tumor mass need not be described except to mention the measurements. The tumor mass seen in the frontal lobe measured 5 cm. in length antero-posteriorly, 4.5 cm. in breadth, and approximately 3 cm. depth. It was dull grayish, approximating brain tissue in color and consistency. On section it had a fleshy appearance, and was in places hemorrhagic. The tumor mass was connected by a broad pedicle to the pituitary gland proper, which was enlarged, being represented by a spheroidal mass of tissue, roughly speaking, 30 mm. in diameter. The bone of the sella turcica was very thin and fragile, and was readily separated from the pituitary gland tumor proper with forceps. The adjacent sphenoid cells were likewise distinctly atrophied, and filled with a semigelatinous fluid.

The pituitary tumor, in its growth, has enlarged the sella turica and pushed aside the sphenoid cells and the clinoid processes. The tumor has advanced upward and forward, pushed aside the right olfactory lobe in front of it, and has gradually developed into the large tumor which was found at autopsy. In its growth, it has invaginated the R. lateral ventricle, especially

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its anterior horn, the ventricle being converted into a narrow slit, and the corpus striatum, with the internal capsule, compressed into a narrow band, which, in its widest portion, is approximately 1 cm. in breadth. The sections and photographs show the distention of the left lateral ventricle.

The brain with the pia mater was above the normal weight, 1,678 grams. The medulla and spinal cord were broad and large. There are two calcareous plaques, similar to those found in the dura mater of the cerebrum, in the spinal pia mater.

Osseous System—The marrow of the ribs is extremely scanty. Marrow of one of the lumbar vertebræ may be said to be normal in appearance. Marrow of the lower end of the femur was, to the best of my recollection, normal in appearance.

In review, the main features of the necropsy are the following:

Enlargement of the inferior maxillæ, of the nose and the ears, characteristic of those found in acromegaly. Likewise enlargement of the fingers and toes, especially the great toes. The presence of a large pituitary tumor; hypertrophied tongue; hyperplasia of the lingual and pharyngeal lymphadenoid tissue; persistent thymus; large pancreas; large spleen; hypertrophy of the corium of the abdominal wall.

Microscopic Examination—Examinations of the sections from the liver, spleen, heart, kidneys, suprarenals, small and large intestines, show no noteworthy features.

Through the kindness of Dr. E. L. Oatman I am enabled to insert his report upon the optic nerve and posterior segment of the right eye.

"Specimen consists of optic nerve and posterior segment of right eye. There is marked œdema of retina and optic nerve head. In some sections the elevation of papilla is 1.5 mm. Œdema of retina most pronounced in nerve fiber and internuclear layers. Outer segments of rods and cones are granular. This change may be attributed in part to post-mortem degeneration. The effusion does not stain with Van Gieson's and is evidently due to stasis. Choroid: The choroid is greatly distended by serous effusion into its tissue and suprachoroidal spaces. The choroidal vessels are distended with blood. The short ciliary arteries are also engorged, which accounts for the congestion of the choroid. There are no plastic exudates or disturbance of pigmented cells. The congestion is evidently passive.

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"*Optic Nerve*—Intervaginal space widely distended with a serous fluid free from inflammatory products. Marked proliferation of endothelial lining cells which have accumulated in abnormally large masses throughout the sheath. (In this connection it would be interesting to learn the nature of intracranial tumor.) The walls of the arachnoidal vessels are greatly thickened, the lumen in many of them is completely obliterated. The pia and nerve septa are greatly thickened. Around the periphery of nerve the nervous elements have been entirely replaced by new-formed connective tissue perineuritis. Large masses of connective tissue have formed in nerve particularly around central vessels. The central vessels are distended. On the papilla the arteries show marked proliferation of media and intima and moderate round-celled infiltration of walls. Diagnosis: Choked disc; chronic interstitial neuritis."

Testicles—Show active spermatogenesis.

Thyroid Gland—Sections of the thyroid gland; the alveoli present the normal variations in size invariably observed in all normal thyroids. No colloid vesicles were noted in the sections or in the gross.

Sections taken from various parts of the tumor resemble closely the normal histological structure of the pre-hypophysis. The tumor is made up of a mass of spheroidal or oval cells, which are grouped in irregularly-shaped lobules or alveoli, by delicate capillary walls, apparently composed only of endothelial lining. At the periphery of the lobules, the cells appear to lie directly upon the endothelial lining of the capillaries. In sections stained by Van Gieson's stain, dilated connective tissue fibrils are, however, made out, separating the cells from the capillary wall. The tumor is everywhere very vascular, and in a few places small areas of hemorrhagic infiltration are present. The lobules are in the main closely packed with cuboidal cells. The nuclei are small, usually oval. The chromatin network is scanty, nuclear membrane is distinct. The protoplasm is moderately eosinophilic, and the cell boundaries indistinct. The stroma, as above said, is scanty. Nowhere in the tumor have whorls of connective tissue been seen.

The two types of cells described in the normal pre-hypophysis cannot be made out, or their presence is only in a few places suggested. It is, however, quite true that there are variations in the staining reactions of the cells, but these are insignificant, in some places the protoplasm being more eosinophilic than in others.

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In some places the protoplasm of the cells appears more granular and the lumina of the acini contain globules of various sizes, as well as a smaller number of free cells, some of which are well preserved while others have poorly staining nuclei. In many sections there are seen groups of larger and smaller acini, lined with a single layer of high columnar epithelium, the cells of which are closely packed together. The nuclei of these cells are oval, and have a scanty chromatin network and small nucleoli. The protoplasm of these cells is granular and moderately eosinophilic. In their lumina is found more or less granular material and globules staining with eosin. These globules invariably stain less intensely than the red blood cells.

The most striking feature of the tumor may be said to be its extremely cellular and vascular structure. The abundance of the material and globules present in the lumina of the acini is a most noteworthy feature, and in this respect the tumor may be said to vary from the normal anterior lobe of the pituitary gland.

The histological descriptions of the adenomatous tumors of the pituitary gland in cases of acromegaly do not mention such a condition, as far as I recollect, but I am not yet sufficiently familiar with the literature of the numerous articles to be sure of my ground. Frozen sections stained with scharlach roth present a few fat droplets, much less than in the normal gland.

Thymus—Microscopically, shows the structure usually found in the organ which persists during adult life.

Pancreas—Except for the changes to be described in the islands of Langerhans, is normal. There is no interlobular or interacinal pancreatitis. There are small areas of post-mortem degeneration, which present the usual features: that is, the nuclei stain poorly or not at all, and the tissue takes with hematoxylin a diffuse bluish tint. The vessels in places show slight thickening. The islands in the sections taken from the middle regions of the organ show the following changes: The cells of many of the islands are hyperplastic, and here vascularity of the capillaries is a noteworthy feature. The cells frequently take on a rather intense eosinophilic stain. In a few islands, the changes noted by Opie are marked; that is, the islands are composed mainly of an indefinite substance, which has undergone hyaline degeneration. The lesion of the islands may be considered as an early stage of the condition which Opie has described in the pancreas of cases of diabetes mellitus.

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On account of the lack of time at our disposal it will be impossible to give a description of the lesions and various theories which have been formulated upon the eitology of acromegalia. Since Sternberg's elaborate article in Nothnagel's System, which appeared in 1897, little advance may be said to have been made in our knowledge of this disease.

Sternberg reviewed 210 cases. Since that time numerous other cases have been reported. Tamburini, in 1897, reported upon 30 cases with autopsies. He noted that all had tumors of the pituitary—either a simple hypertrophy of the gland, or a total involvement in an adenoma, in which were preserved the principal elements of the gland. Tamburini was the first to bring out the theory of hypersecretion as the etiological factor of the disease. He based his view on the following facts:

In acromegalia the gland was never atrophied, and the symptoms of the disease were absent in cases of pituitary tumors which are heterological or atypical of the normal pre-hypophysis; in other words, where the gland was atrophied or diseased or in a condition where it was reasonable to suppose that abolition of its function had occurred, the disease was not present. He therefore concluded that the constant presence of a tumor and the nature of these tumors—hypertrophy or typical adenoma—supported the view that acromegalia is caused by a hypersecretion of the gland. The disease process is thus analogous to that of Basedow's disease.

In an elaborate and complete article which appeared in 1898, in which three cases, with autopsies, were reported, Brooks has supported Tamburini's hypersecretion theory.

Sternberg has divided cases of acromegalia into three groups, according to the duration of the disease. (1) The benign form, the disease running a slow course (50 years) with slight symptoms. (2) The usual form, 10 to 20 years. The majority of cases fall in this group. (3) The acute malignant form, 3 to 4 years. The case now reported would fall in this group.

Six cases were reported by Sternberg, as belonging to the acute group. One of these was by Hansemann. In all the cases running an acute course, and only in these, was there observed a true sarcoma of the gland. These are of great interest in connection with the etiological relationship of a hypersecretion of the gland to the disease process. For in a true sarcoma of any organ one would not expect to find hypersecretion. Brooks, in

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order to overcome this difficulty, has boldly asserted that the cases reported as sarcoma were not correctly diagnosed, claiming that they were probably all of them adenoma or hyperplasia. It seems almost impossible to believe that this view can be correct, for it is reasonable to suppose that such an observer as Hansemann would be familiar with the normal structure of the pituitary gland.

In the case now reported the resemblance of the tumor of the normal gland is so very striking that I believe no one could fail to identify it as the pituitary gland.

The point I wish to emphasize especially is my firm conviction that in doubtful cases of acromegalia the so-called *formes frustes;* that is, those cases in which the upper jaw is large, the lower being small, the face presenting the *type carré* as opposed to the *type ovoide,* the diagnosis of the disease cannot be made from the histological appearance for the following reasons: First, because it is extremely difficult to be certain of the existence of hypertrophy in any gland, especially so in the case of the pituitary gland, and second, because the presence of a small adenoma is not an unusual occurrence where no acromegalia is present. Erdheim thus reports a case of a man 42 years old, with an adenoma, the gland being normal in size. We have the same condition of affairs in connection with the thyroid, for it is undoubtedly true that many cases of parenchymatous struma are not accompanied by Basedow's disease.

In many cases of acromegalia the gland has been found normal in size, and special emphasis seems to have been made upon the soft condition of the organ, a not unusual characteristic in cases dying with high fever, in meningitis, etc., where the post-mortem changes may be rapid, and also where care is not exercised in removing the gland from its bony surroundings.

Special attention has been called to the increased number of chromophile cells in the pituitary tumor of acromegalia. These cells are considered to be the functionating cells of the gland, and this fact has lent support to the hypersecretion theory. In our case the chromophile cells are not increased in number, and in fact none of the cells can be said to resemble the chromophile cells which are found in normal glands, a statement in accord with Erdheim's description of the histological structure of the pituitary tumor in the case of acromegalia he reported.

Before closing, it may be of interest to state briefly that gigantism is frequently associated with acromegalia. According

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to Sternberg, 20 per cent. of the acromegalics are over 177 cm. in height, that is, 5 ft. 11 in., and 40 per cent. of all giants are acromegalics. It is thus seen that giants are more often acromegalics than acromegalics are giants. According to Kundrat, giants are subject to all sorts of dystrophies and vegetative disturbances, and therefore they are predisposed to become acromegalics.

The association of glycosuria with acromegalia is a very constant one. The physiological relation of the pituitary gland to the pancreas has, as far as my knowledge extends, not been definitely settled. That the relationship between the pituitary and the thyroid gland is a close one is well known. A persistent thymus has been noted in a large number of cases.

Two views are held concerning the two types of cells found in the gland. (1) Saint Rémy (1892) suggested that the two types of cells are merely functional stages of one cell. Benda (1900) was apparently able to trace the transition from the chromophobe or chief cell to the eosinophilic or chromophile cell. The small cells, with few granules, according to him, are the indefinite embryonal cells which are multiplying, the large granular cells being actively functionating.

Scaffidi (1904) held the opposite view; namely, that the two types of cells have different functions, each type of cell producing a specific substance, a view apparently confirmed by the experimental results obtained by Schäfer and Vincent (1899) who extracted two substances from the gland, one depressing, the other stimulating the nervous system and raising the blood pressure.

REFERENCES.

Benda. Berl. klin. Wochenschrift, 1900, XXXVII., pp. 1205-1210.
Brooks, Harlow. Acromegalia. Archives of Neur. and Psychopath, 1898, I., p. 485.
Erdheim. Beiträge zur path. Anat und allge. Pathol., 1903, Bd. 33, p. 227.
Saint Rémy. Arch. de Biologie, 1892, XII., p. 425.
Scaffidi. Arch. für mikr. Anat., Bonn, 1904, LXIV., p. 235.
Schäfer and Vincent. Journ. Physiol., 1899, XXV., p. 87.
Sternberg. Nothnagel's System, 1897.
Tamburini. Archiv. de Neurologie, 1897, Tome V., p. 621.

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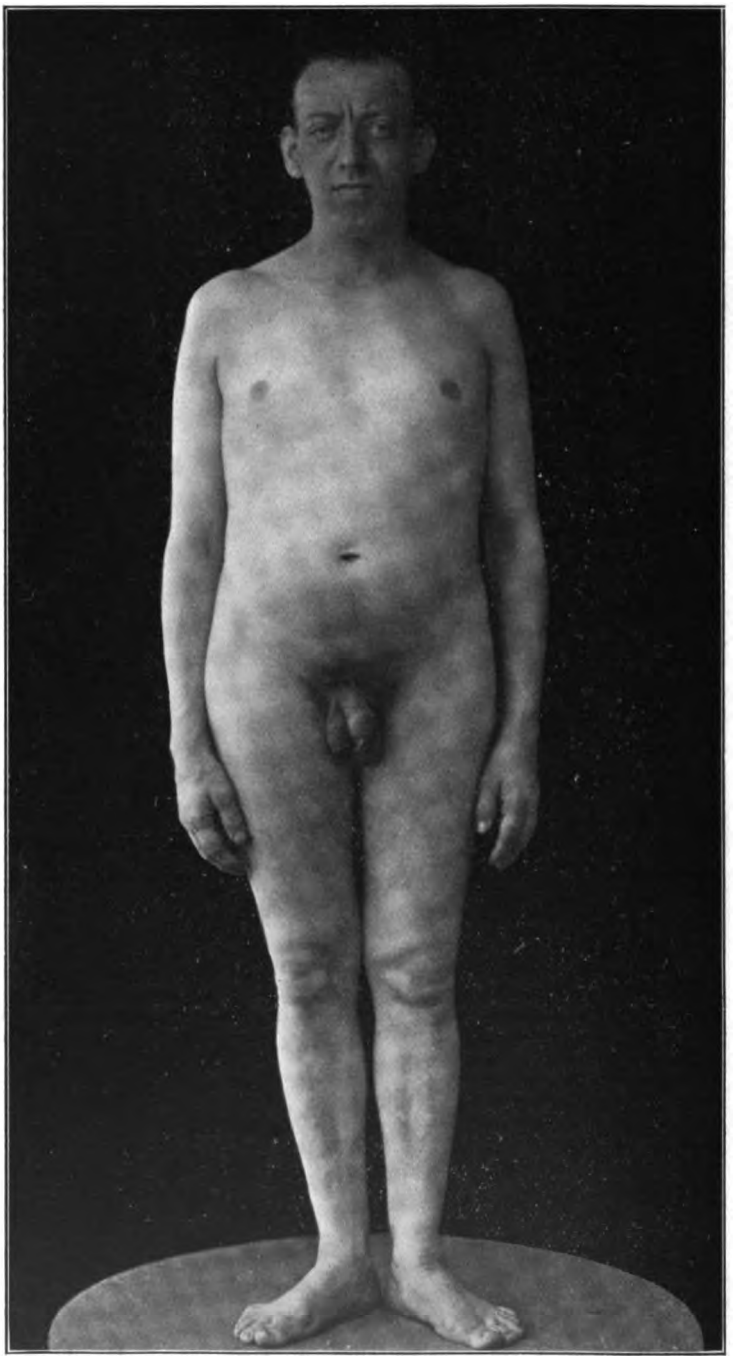

FIG. 1.—PHOTOGRAPH TAKEN IN EARLY STAGE OF ILLNESS.

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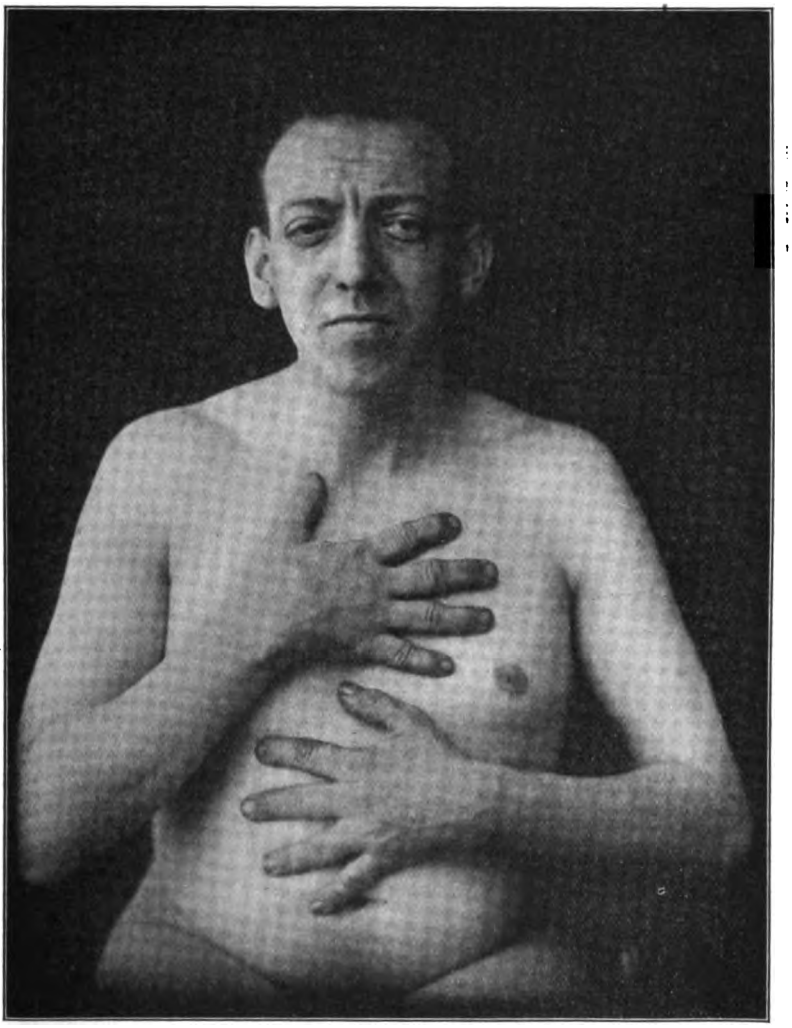

FIG. 2.—PHOTOGRAPH TAKEN IN EARLY STAGE OF ILLNESS.

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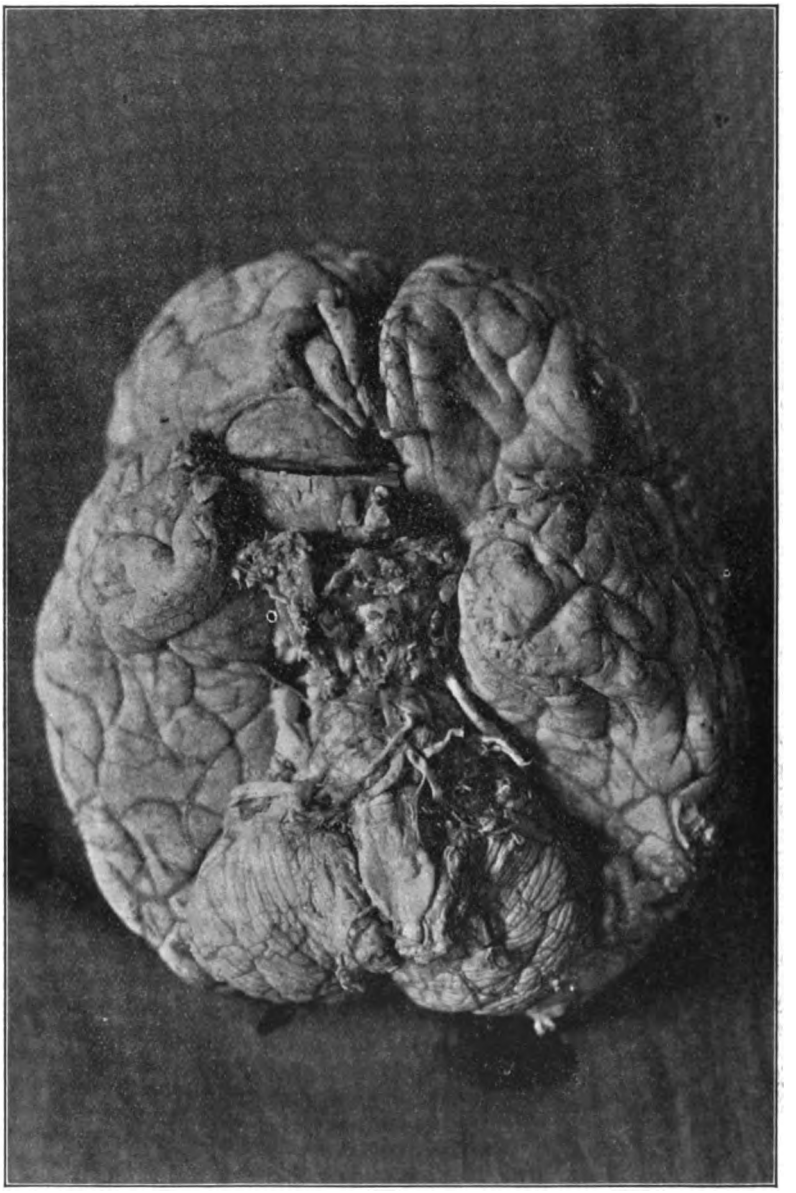

FIG. 3.—INFERIOR SURFACE OF BRAIN, SHOWING PITUITARY TUMOR EXTENDING INTO RIGHT FRONTAL LOBE.

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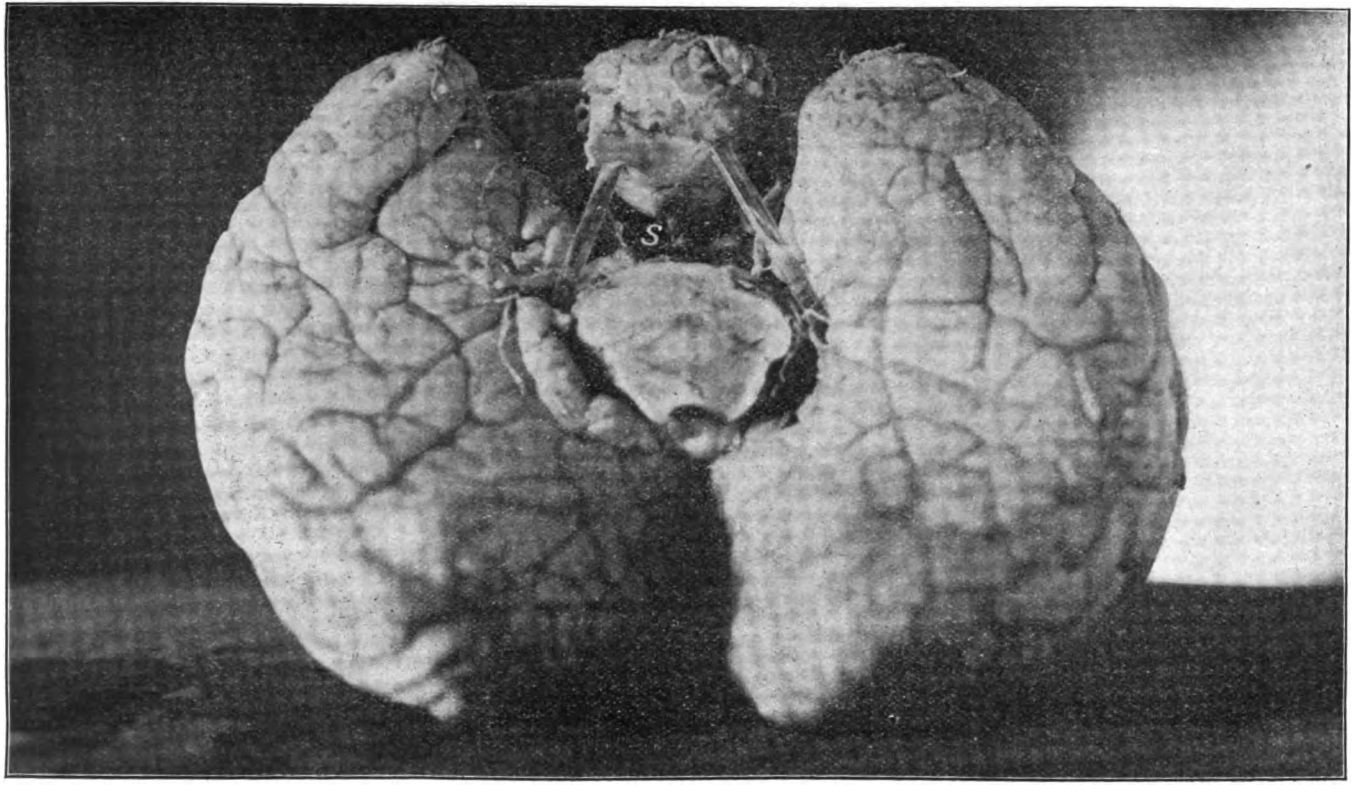

FIG. 4.—POSTERIOR VIEW OF TUMOR, SHOWING HYPOPHYSEAL STALK, (S)

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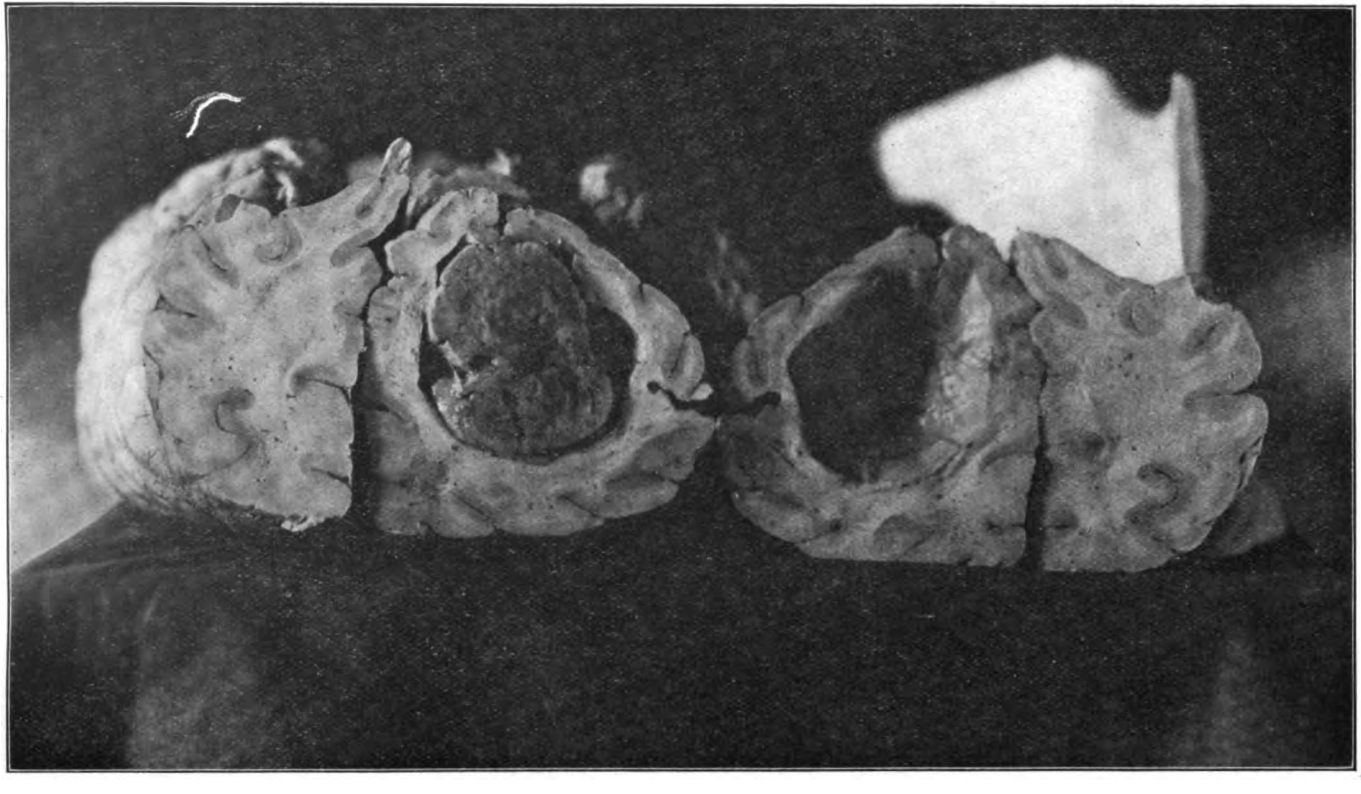

FIG. 5.—CROSS SECTIONS OF THE BRAIN, SHOWING RELATION OF TUMOR. THE EXTRAVENTRICULAR SITUATION OF THE GROWTH MAY BE SEEN IN THIS PHOTOGRAPH.

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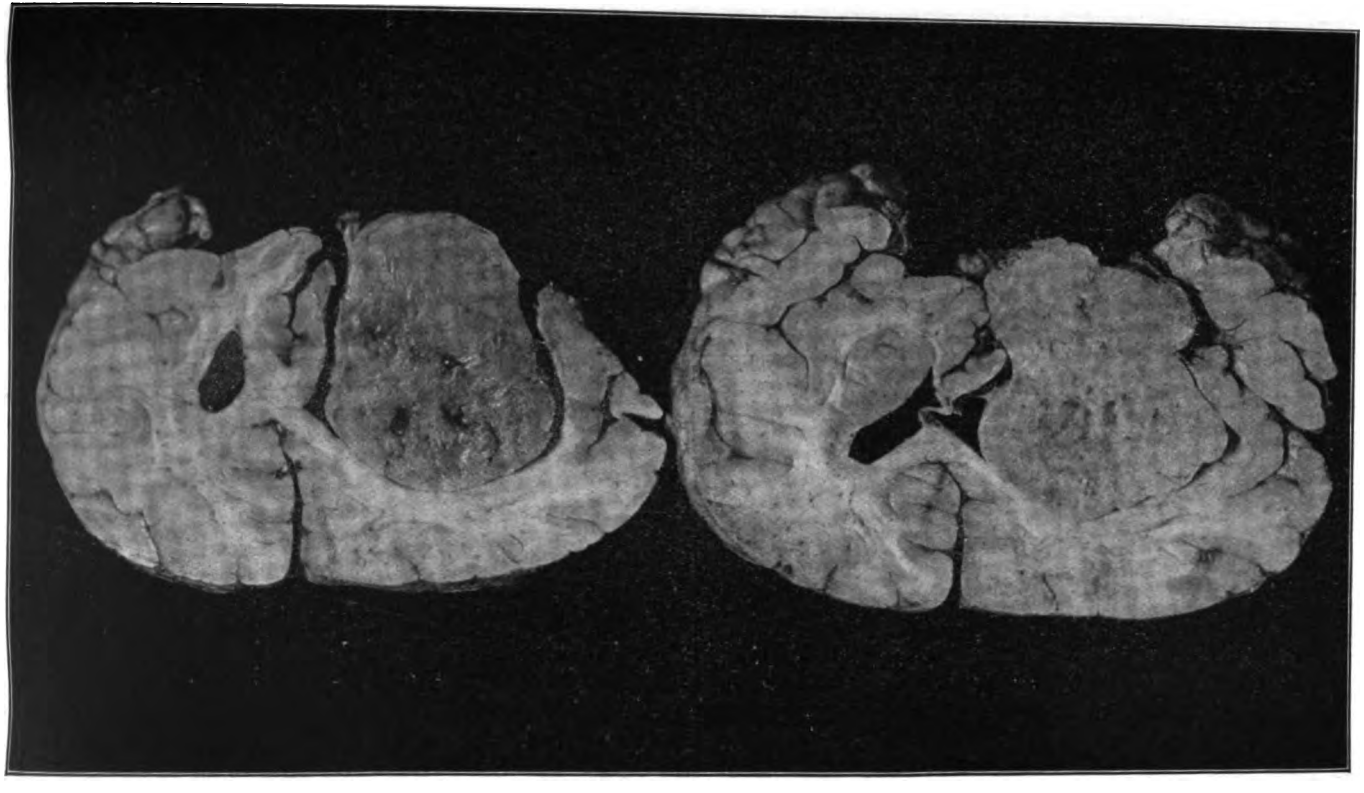

FIG. 6.-CROSS SECTIONS OF THE BRAIN, SHOWING RELATION OF TUMOR. THE EXTRAVENTRICULAR SITUATION OF THE GROWTH MAY BE SEEN IN THIS PHOTOGRAPH.

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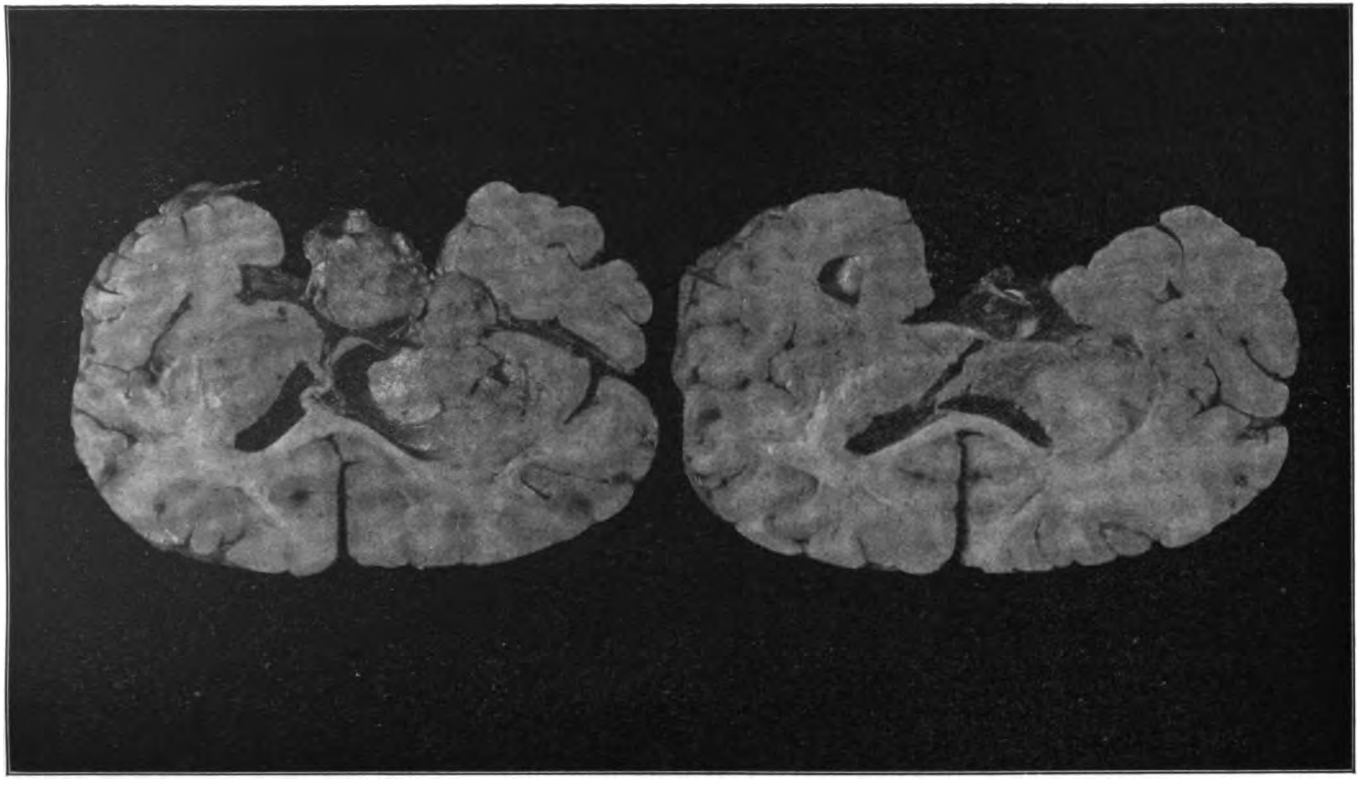

FIG. 7.—CROSS SECTIONS OF THE BRAIN, SHOWING RELATION OF TUMOR. THE EXTRAVENTRICULAR SITUATION OF THE GROWTH MAY BE SEEN IN THIS PHOTOGRAPH.

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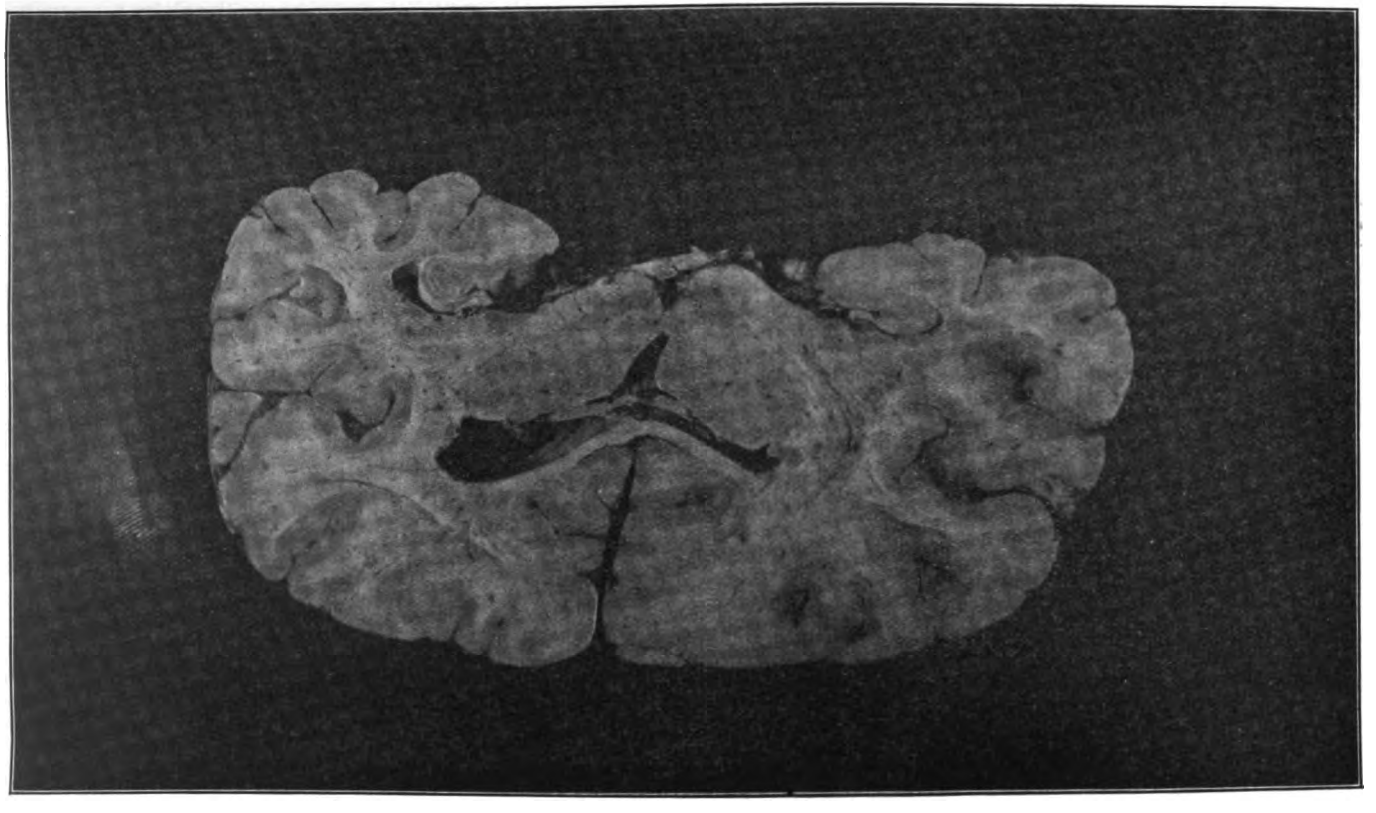

FIG. 8.–CROSS SECTIONS OF THE BRAIN, SHOWING RELATION OF TUMOR.

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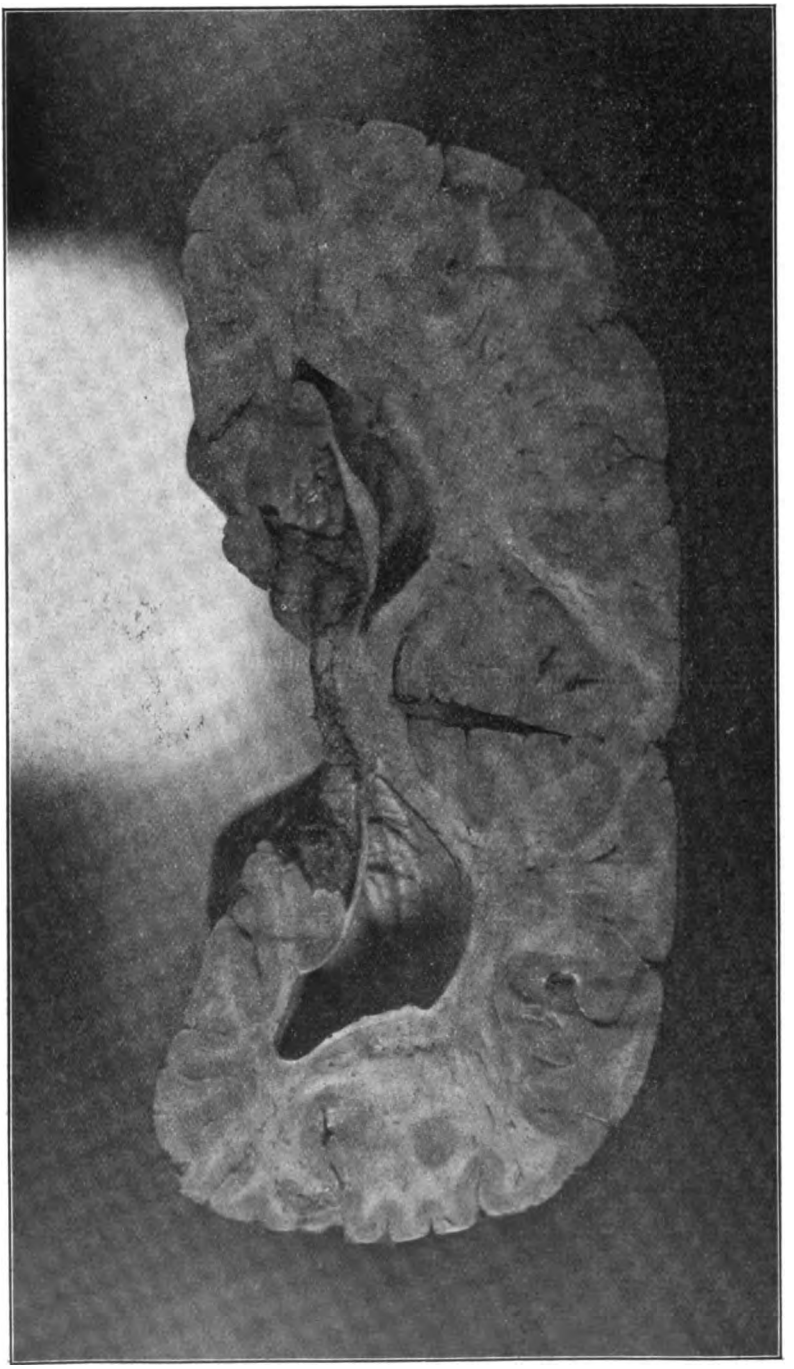

FIG. 9.—CROSS SECTIONS OF THE BRAIN.

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THE TREATMENT OF THYROIDISM BY A SPECIFIC CYTOTOXIC SERUM.*

By John Rogers, M. D.,

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AND

S. P. Beebe,

During the past two years a large number of cases of hyperthyroidism have been treated with a specific serum.† Preliminary papers‡ have been published dealing with the preparation of the serum and the therapeutic results obtained by its use. In the present paper we propose to discuss the questions arising from this study from the standpoint of accumulated experience and it is hoped to make the method so plain that any physician may understand the *rationale* of the treatment and the special points to be observed in its application. There are two fundamental propositions to be considered, viz., the nature of the serum and the nature of the disease. These will be considered in order.

The Serum—We have called the serum which we have used specific because we believe that it has a special action on the thyroid gland, and it is necessary for the argument that the grounds for such belief should be reviewed. It is now a well-known and universally admitted fact that the proteid of each animal species has a characteristic physicochemical structure; in other words, it is specific. The chemical methods by which differences in structure are determined have not as yet been refined

* This article represents the Mütter Lecture which was delivered before the College of Physicians in Philadelphia, Dec. 13, 1907.

† It will be recalled that the serum to which we refer is made by inoculating animals (rabbits or sheep), with the pure proteids from the human thyroid gland. In the beginning the proteids were obtained only from goitrous glands, but more recently the proteids from normal glands have been used successfully.

‡ Beebe, S. P.: Preparation of a Serum for the Treatment of Exophthalmic Goiter, Jour. Am. Med. Assn., 1906, xliv., 487. Beebe: Tr. Assn. Am. Phys., 1906, p. 548. Rogers, John: The Treatment of Thyroidism by a Specific Serum, Jour. Am. Med. Assn., 1906, xlvii., 655.

Reprinted from the Archives of Internal Medicine, Nov., 1908.

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to a sufficient extent to render it possible to make a chemical distinction between proteids from closely related species of animals, but the methods employed in immunity investigations of the last few years have been thus refined and their reliability has been demonstrated in such degree that the results obtained by these methods are accepted by most investigators as demonstrating specific characters of the proteid in each animal species. This specificity is not absolute, for it has been found that a serum made against the proteid of a given species will show a mild reaction against the serum from closely related species, but by observing the time and the dilution in which the reaction takes place it is possible to distinguish sharply between species. Heterologous proteids, that is, proteids from different species, may be readily separated by means of these serum reactions, and it seemed to us reasonable to believe that a method capable of making such fine distinctions would enable one to differentiate between homologous proteids, that is, between proteids taken from the different organs of the same species. The widely varying functions of the different organs are dependent on the physicochemical structure of the various cells which compose them, and it would seem there must exist sufficient individuality of structure in organs which have such widely varying functions as the liver and kidney to permit of its recognition by the highly selective biologic method. One of the most suggestive researches in this line was that of Uhlenhuth,* who found it possible to differentiate sharply between the proteids in the white and yolk of the egg by means of a serum made against one or the other of these proteids. He found that it was possible to get a mild reaction to the proteids of the yolk by means of serum developed against the proteids of the white of the egg, but only slowly, even in high concentrations of serum, so that in point of time and in delicacy the reactions of these homologous proteids against their own serum was specific.

If the serum is developed by injecting the pulp of an organ into some alien species of animal, we shall develop anti-bodies against all the proteids so introduced, and it is obvious that such a serum must contain a number of factors. Certain of these may be specific, since they are developed against the proteid which is found only in the particular organ in question, while others, such as those developed against the blood, must be common. A very

* Uhlenhuth: Zur Lehre von der Unterscheidung verschiedener Eiweissarten mit Hilfe specifischen Sera. Festschrift, Geburtstag von Rob. Koch, Jena, 1903, p. 49.

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large number of experiments are now on record which support such a conclusion, but in many of them the specific action is so obscured by the common action that its demonstration has not always been satisfactory. In a paper published three years ago by one of us† this question was discussed and the reasons were given for choosing certain pure proteids—viz., the nucleoproteids —from organs as nearly blood-free as practicable, for developing specific antiserum. Reasons were given in that paper for believing that relatively more of the specific factors and less of the common element were produced than by including the whole organ pulp in the injected material. The specific action of such serum has been determined by the precipitin test, the agglutinin test, and by injection of the serum *in vivo*. The precipitin test is well known. The agglutinin test is similar to that employed in bacterial reactions, except that a suspension of finely divided tissue fragments is substituted for the bacterial emulsion. Such reactions *in vitro* show that homologous proteids may be differentiated sharply from one another. In point of time and in completeness of the reaction the serum is specific. When introduced into the body the reactions are specific in the sense that severe lesions can be produced in the selected organ without causing a corresponding lesion in other organs.

The serum has at least two factors: first, the factor common to proteids of all the organs of the body, and to a lesser degree the proteids of closely related species; second, the specific factor acting on one particular organ. We have found it possible to demonstrate these two factors by means of absorption experiments. If we inject dog-kidney nucleoproteids into a rabbit we produce a serum which gives a mild reaction with dog serum, also with proteids from the dog's liver or other organs, but a very marked reaction with kidney proteids. If we now add to this serum a considerable quantity of dog-liver tissue ground to fine hash and allow the two to stand in contact for a few hours in the refrigerator, and then filter, first through paper, and later through a Berkefield candle, we find that the common factor of the serum has been removed.* Such serum no longer has any precipitating or agglutinating effect on liver proteids or suspension of liver tissue fragments, nor does it act on any other proteids except

† Beebe, S. P.: Cytotoxic Serum Produced by the Injection of Neucleoproteids, Jour. Exper. Med., vii., 733.

* The liver tissues used for this purpose were not blood-free.

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those from the kidneys, and on the latter its action, although very marked, is somewhat less than before the absorption. By the addition of a large number of washed erythrocytes, one may also absorb the common factor. Such absorbed serum will cause kidney lesions when injected intravenously into the dog's circulation. If, however, one absorbs the kidney serum with kidney tissues one finds that the specific factors and the common factors have both been removed.†

The serum which has just been described was made from organs containing a small amount of blood, and one of the criticisms which has been made of this work is based on the fact that the serum itself is slightly hemagglutinative and hemolytic. The lesions found in the body after the injection of such serum are explained by these critics (Pearce and Jackson*) by assuming that the serum has caused the formation of small emboli of erythrocytes and that the resulting thrombi have caused anemic necroses. The lesions which we found, however, were not of that type, and moreover, they were produced also by serum from which hemolytic factors had first been absorbed in the manner described above; we conclude, therefore, that they have been produced by a special organ cytotoxin. We have some corroborative evidence that the hemolysins are not actively concerned in producing the lesions, viz., the plain unabsorbed serum is slightly hemolytic *in vitro,* and yet when injected into an animal it invariably was followed in a few hours by the presence of an increased number of red cells in the blood and at the same time a severe lesion was being produced in some specific organ. We have in such findings no evidence of blood destruction.

We have reviewed the principles of the serum at this length because it is of fundamental importance that we establish reasons for believing that serum made from the thyroid gland has a special action on that gland; for obviously if the serum acts as much on the kidneys, the liver, or the intestinal epithelium as it does on the thyroid, we have no logical ground or excuse for using it in the treatment of disease of the thyroid gland.

The methods followed in the making of the serum have been described in a previous article and no essential change has been

† Beebe, S. P.: Nucleoproteid Immunity, Brit. Med. Jour., 1906, p. 1786.

* Pearce and Jackson: Concerning the Production of Cytoxic Sera by the Injection of Nucleoproteids, Jour. Infect. Dis., 1906, iii., p. 742.

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made during the last year.† We are not yet fully acquainted with the differences between a serum made from the nucleoproteid and that from the nucleoproteid and globulin combined; but we are still inclined to the belief that the serum from the nucleoproteid is more cytotoxic than that from the globulin, though the latter proteid is more efficient in the development of antitoxins.

We wish again to emphasize the fact that the serum must be made from human thyroid glands, because of the biologic specificity of proteids. It would be quite as logical to use tetanus antitoxin in the treatment of diphtheria as to use a serum made against sheep thyroid in the treatment of a human subject. We can get no evidence *in vitro* that such a serum has any antagonistic action against the human thyroid proteids. On this ground alone, therefore, the negative results which Murray* obtained in the use of serum made in a goat against sheep proteids are precisely what should have been expected. Our serum has been made in sheep and rabbits against the proteids of the human thyroid gland.

One never reaches a condition of immunity at all comparable with the immunity to a diffusible bacterial toxin. From three to four times the initial dose of proteid may be safely given at the end of the immunization period, but one can not go beyond this point.

Although the serum shows a high degree of antagonistic action *in vitro* it does not in the immunized animal protect against excessive doses of the specific proteid. We have, nevertheless,

† The various steps in the production of this serum are briefly as follows: The fresh, human thyroid glands, which must not be preserved in formalin, or alcohol, or any substance which coagulates the albumin, are ground to a very fine pulp and extracted in several times their volume of salt solution made faintly alkaline with sodium hydroxid. Extraction is carried on in a refrigerator for twenty-four to thirty-six hours, and chloroform or thymol may be added to prevent bacterial growth. The coarser particles in the extract are then removed by straining through gauze, the filtrate centrifugated and filtered through paper. A clear extract may be readily obtained by filtering the strained extract through a Buchner funnel filled with paper pulp. We have found that a very convenient method for precipitating the proteids from this extract is to acidify with acetic acid to a concentration of 0.1 per cent., add a sufficient amount of saturated sodium chlorid solution to make the concentration of the salt in the extract 10 per cent. of saturation, and then heat to 44 degrees C. for half an hour. Under these conditions we obtain an abundant flocculent precipitate which may be readily washed, redissolved by the addition of a small amount of alkali and reprecipitated by the addition of acetic acid. The proteid is redissolved and reprecipitated three times, and is thoroughly washed each time. The purified proteid is dissolved in alkaline salt solution for inoculation into the peritoneal cavity of the rabbit or sheep in which we develop the serum. From five to eight inoculations one week apart are given to each animal before the blood is withdrawn and the serum prepared in the usual method.

* Murray: Lancet, London, Nov. 11, 1905.

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data from some experiments which indicate that it does have some power of conferring passive immunity. Six fresh adult rabbits were kept under observation for some days to make sure that they were in a healthy condition. One group of three was then given for two successive days 5 c.c. doses of an active thyroid antiserum previously made in other rabbits. There was no reaction because of the biologic identity of the serum. Twelve hours following the second injection of serum, all six rabbits were given large doses of human thyroid proteids. The three protected rabbits had a milder immediate reaction and the late effects, such as loss of weight, were much less marked in this group than in the non-protected group. Clinically, we see acute toxic cases in which the subjects experience very marked and quite immediate beneficial results from the injection of the antiserum, a result quite similar to what we should expect if we were neutralizing a toxic substance. Obviously we can not be so certain of our ground here as we can in a laboratory experiment in which we can control matters so as to have fewer unknown factors.

The Disease—In our previous paper* we have outlined the evidence for believing the symptoms of the disease to have their origin in a condition of hyperactivity of the thyroid gland. Such a mode of origin is a fundamental premise in our treatment of these cases with an active antiserum designed to neutralize the toxic effects of thyroid proteid in the circulation, and also to inhibit the secretory activities of the gland. The symptoms of thyroid cases, tremor, nervous irritability, tachycardia, diarrhea, perspiration, rapid loss of weight, have all been produced in animals and also in the human subject by the administration of thyroid preparations. The almost constant occurrence of goiter, the histologic appearances indicative of increased activity, and the greatly increased circulation through the gland vessels, together with the amelioration of the condition by surgical removal, are additional arguments that the gland is a fundamental factor in the disease. The large relative lymphocytosis, and the diminished excretion of kreatinin with increased output of kreatin are the usual findings in the typical well-developed patient with Basedow's disease, and these blood findings have likewise been produced by the administration of thyroid preparations to healthy animals.† A discussion of the etiology of the disease is not with-

* Beebe, S. P.: Tr. Assn. Am. Phys., 1906, p. 548.

† Perry: Some Studies of the Blood in Thyroid Feeding in Insanity, Med. Rec., August, 1906.

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in the scope of the present paper, and we accept provisionally the theory that in typical cases the characteristic symptoms have their origin mainly in the hypersecretion from the thyroid gland.

There are certain limitations to our knowledge in this matter, however, which should be pointed out. It is not known whether the physiologic activity of the gland is dependent solely on the iodized proteid therein contained, and, if so, whether the activity is measured by the quantitative amount of iodin present. As has been pointed out elsewhere, there is an increased amount of nucleoproteid‡ in the gland in Graves' disease, but this is a function of the cellular hyperplasia and we do not know whether or not it has any significance in the physiologic action of the secretion.

There is no experimental evidence to determine whether or not the secretion from the gland in Graves' disease has more or less physiologic activity than the normal gland or whether the secretion is so altered in character as to have an entirely different sort of action, and in the diseased condition we must consider the possibility of a defective functioning of other organs which normally are stimulated by the secretion. We have very few methods of estimating the physiologic value of the secretion under normal conditions, the measurement of the protective power to acetonitril poisoning proposed by Reid Hunt* being the only one having quantitative possibilities.† Until the normal physiology of the gland is better understood we can only deal with the surface indications; and these point to the thyroid gland as one important source of the symptoms in typical cases of hyperthyroidism.

Graves' disease presents a great variety of clinical pictures which in many instances vary so widely from the typical textbook description as to be scarcely recognizable. It has been observed for many years that there is often a progression from a typical Graves disease through a mixed, indefinite type to a characteristic condition of myxedema. These clinical conditions are the accompaniment of changes in the pathologic structure of the thyroid gland.

‡ Beebe, S. P.: Physiology of the Thyroid Gland in Its Relation to Exophthalmic Goiter, Jour. Am. Med. Assn., Oct. 5, 1907, xlix., 1155.

* Hunt, Reid: Influence of Thyroid Feeding on Poisoning by Acetonitril, Jour. Biol. Chem., 1905, i., p. 33.

† We have made a series of experiments on this point which will be reported later in detail, but our conclusion is that the method is not suitable for detecting small quantitative differences.

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Ewing‡ has described four distinct types or stages in the natural history of the thyroid gland of Graves disease:

1. In the early stages of the disorder, only hyperemia with increase of colloid showing diminished staining reaction with eosin. Microscopically the gland may show no gross changes.

2. Hyperemia with increased colloid, and cellular hyperplasia.

3. Extensive cellular hyperplasia, with increase of imperfect alveoli lined by large or giant cells, and nearly complete loss of colloid.

4. Late stages with fibrosis, atrophy of cells, sclerosis of vessels, hemorrhages and cysts.

There is thus a complete series of changes from the thyroid of early Graves' disease to the pronounced alterations of myxedema, with many intermediate forms, especially in the older cases. It is obvious that the symptoms accompanying changes of such diversity must vary extremely and it is not to be expected that any one treatment, however effective it may be in one stage, can be equally applicable to all stages or types of the disease. Moreover, as the disease progresses, complications may arise in other organs, as, for example, chronic myocarditis, so that the therapeutic problem in advanced cases becomes extremely complex. We do not know how important the relations of the thyroid to other ductless glands may be. The thymus gland has been found hypertrophied in those cases in which autopsies have been made in New York during the last few years, and the lymphatic tissue in general increased in amount. Hansemann* is of the opinion that these changes are secondary to the functional overactivity of the thyroid. These facts must be correlated with the high lymphocytosis characteristic of all severe cases and with the fact that it is possible to produce a lymphocytosis by the administration of thyroid to normal animals. It appears, then, that in the young subjects with characteristic symptoms of a recently developed condition of hyperthyroidism we are dealing with a comparatively specific disease which may be alleviated by neutralizing the toxic secretion of the gland; but in the older cases which have existed so long as to cause secondary changes and which may have symptoms of both Graves' disease and myxedema, or which indeed may be a myxedema in

‡ Ewing: Pathology of Exopthalmic Goiter in Its Relation to the Serum Treatment, New York Med. Jour., 1906, p. 1061.

* Hansemann: Berl. klin. Wchnschr., Oct. 30, 1905.

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nearly every particular, masquerading under the name of Graves' disease because of the primary condition of the patient, it is not to be expected that the serum will have curative effect. And such a conclusion must apply with equal force to the operative removal of the gland or to any form of treatment aimed directly at the thyroid. Analogously, if diphtheria were a chronic disease extending over some months, one would not expect to restore the damaged heart, kidney and nervous system in an advanced case by any amount of serum prepared against the Klebs-Loeffler bacillus and its toxins. There is an abundance of clinical evidence demonstrating the specific action of thyroid preparations in myxedema, and in a small percentage of cases of Graves' disease improvement is obtained by careful thyroid treatment, but by far the majority of typical cases of this disease are made worse by such medication. It is therefore of prime importance to recognize the type of the particular case in order to treat it intelligently. We emphasize this point, because in some instances cases of myxedematous type have been treated by serum, and occasionally, indeed, by operation with very unsatisfactory results.

Classification—It is impossible to make a comprehensive classification of patients suffering from thyroid disease unless one makes almost as many groups as there are patients. In determining whether a given case is a favorable one for serum treatment it is necessary to study the condition carefully to determine if possible whether the symptoms are those of hyperthyroidism or hypothyroidism. A careful study of the blood, including the number of erythrocytes, the percentage of hemoglobin, and a differential leucocyte count, together with a quantitative analysis of the nitrogenous constituents of the urine, will be of value in this respect. In the majority of cases it is possible to decide this point, but we have not found any criterion accurate in all cases and we suggest the necessity for thorough study of the doubtful types in order to establish a more reliable means of classification. The following classification is made solely for the purpose of serum treatment, with a full recognition of the fact that it does not cover all cases, and with the reservation that it is necessary to experiment carefully with many of the atypical cases before one can determine what form of treatment is most suitable. In making these groups we take into consideration the age of the patient, the probable condition of the thyroid, the clinical type of the disease as regards symptoms referable to the thyroid, and also as regards secondary changes in other organs.

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Types Favorable for Serum Treatment—1. Typical exophthalmic goiter in the early stages, including the incipient, the mild, the severe, and those extremely severe forms which develop very rapidly and have been described as the acute toxemic type, resembling malignant endocarditis.

2. Typical exophthalmic goiter in cases which may have existed for some time in subacute form with occasional exacerbations, but without marked secondary changes.

Types That May Require Combined Treatment—1. Patients who develop thyroidism after reaching the age of 40 or 50 years:

(*a*) Those who, after middle life, show thyroidism for a varying period before the appearance of a goiter.

(*b*) Those who have borne an innocuous goiter for years and late in life develop signs of thyroidism.

2. Atypical forms of thyroidism:

(*a*) Men and more often women of any age who present many signs of thyroidism, but who often have a dry skin and bradycardia and are usually considered neurotic or neurasthenic.

(*b*) Patients with nervous and vasomotor signs of thyroidism, but who complain of a more or less constant headache accompanied in most cases by nausea and abdominal discomfort.

(*c*) The psychopathic cases, the mental disturbance having no definite relation to the severity or type of thyroidism.

The purpose of the classification given above is to serve as an aid in the serum treatment, and in our opinion the groups outlined can not be omitted. Before entering a discussion of the prognosis, the results which we have obtained, and the method of treatment in each separate group, it is necessary to consider briefly some of the simpler fundamentals of the thyroid chemistry.

Physiologic Chemistry of Thyroid Proteids—There is as yet no agreement among investigators as to the chemistry of the thyroid secretion, and its physiology is even more obscure. Various chemical substances have been isolated from the gland by different methods and it is impossible to reconcile all the statements that are found in the literature. The physiologic activity of the secretion is probably due to the iodin compound which it contains, and we have abundant evidence in the analyses reported by Oswald* that the iodin may vary within wide limits, even in health. There has been no demonstration that an iodin-free pro-

* Oswald: Ztschr. f. Physiol. Chem., xxxii., 1901, p. 121.

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teid from the thyroid has any marked physiologic effect. We may believe that the activity of the secretion stands in close relation to its iodin content. It is not known, however, whether the iodin must be in proteid combination to exert its full physiologic action or whether some cleavage product is equally active. The accepted methods of measuring the physiologic value of thyroid preparations do not permit of accurate quantitative distinctions. As a physiologic process the secretion enters the blood or lymph without the intervention of digestion and it seemed to us that its hypodermatic administration would give the best therapeutic results. Saline and glycerin extracts of the gland have, therefore, been preferred and also certain pure proteids have been isolated and kept in solution for hypodermatic administration. The methods followed in making these extracts and proteids were the simplest possible. In the beginning of the work glycerin extracts were preferred, but these caused so marked a local reaction when given hypodermatically that their use was abandoned and a saline extract substituted. This latter solution has been made by thoroughly pulverizing fresh thyroid glands and extracting the hashed mass for from three to five days in five volumes of physiologic salt solution with the addition of a little chloroform to prevent bacterial growth. The extract is filtered first through paper and finally through a Berkefeld candle and sealed in small glass tubes until wanted for administration.

It is not known whether there is more than one iodized proteid in the gland. If one prepares a saline extract of perfectly fresh thyroid glands one finds that a considerable proportion of the proteid therein contained may be precipitated by the addition of acetic acid. From the filtrate a further portion of proteid is precipitated by half saturating with ammonium sulphate. Both these proteids contain iodin and are physiologically active. Oswald* maintains that they are identical proteids, and there is certainly much evidence to favor his belief in the case of normal glands. With pathologic glands in the stage of cellular hyperplasia the acetic acid precipitate contains more phosphorus and less iodin than the ammonium sulphate precipitate. With normal glands the amount of the proteid which is precipitated by the acetic acid depends on the freshness of the glands, the concentration of the saline extract made from them and the amount of

* Oswald: Die Eiweisskörper der Schilddrüse, Ztschr. f. Physiol. Chem., 1899, xxvii., p. 147.

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acid used in the precipitation. Dilute extracts of perfectly normal glands may give no precipitate at all with acetic acid, while a concentrated extract from the same gland yields an abundant precipitate on the addition of acetic acid. Proteids obtained by both methods of precipitation, that is, by acetic acid and by ammonium sulphate, have been administered, but we were dealing with normal glands and it probably made no difference whether we used one or the other, for the evidence indicates that the two precipitates are of the same identical proteid. With pathologic glands, there may be a considerable difference in the therapeutic effect of the two sorts of proteids. The normal thyroid gland differs sharply from other normal glands, such as the liver or kidney, in having a large proteid content which forms no part of a living cell, so that the cell nuclei furnish only a relatively small amount of the proteid in a saline extract. With some of the pathologic glands nuclei are as abundant as they are in liver or kidney and the acetic acid precipitate contains more phosphorus than is obtained from normal gland extract, while the iodin containing globulin precipitated by half saturating with ammonium sulphate is relatively scanty. It is to be expected that proteids having such chemical differences would show differences in therapeutic action. The dose of these pure proteids is very small. We rarely use more than 15 minims of a 1 to 1,000 solution at a single dose, an amount corresponding to the dose of adrenalin. We have been able to get satisfactory therapeutic results with less disturbance of the heart and nervous system by the use of the proteids isolated in this fashion than we have by the use of the commercial tablets. The matters relating to the preparation and physiologic value of these proteids are now under investigation and it is quite probable that new methods may be substituted for the ones we have already employed.

These proteids were prepared in the first place in order to alleviate the occasional severe and unpleasant reactions following the use of the antiserum. These reactions occurred more often in those patients who had had the disease for a long time or who had acquired it after middle life. In these two groups atypical cases were occasionally found with some of the symptoms of myxedema, and since the antiserum was not well borne, and because of the many reports in the literature of the successful treatment of such cases by thyroid preparations, we were led to believe that a prothyroid treatment rather than antithyroid treat-

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ment was indicated. The hypodermatic administration of thyroid proteids approaches more nearly to physiologic conditions than administration by mouth. Certainly we get more prompt effects by this method and our experience in a large number of cases justifies our belief that pure proteids are more suitable for therapeutic uses than the whole gland substance.

Treatment—In the discussion of the treatment the classification given above will be followed, and the methods and results given under each group. The statistics given in this paper* do not include the 105 cases which Dr. Rogers has treated personally, as they are reported in detail at the end of the paper. All of the 141 patients reported herewith, except three which died, have not taken serum for six months and many of them have completed treatment for eighteen months. Serum has been furnished to 126 cases in addition to those which Dr. Rogers has treated, but they are not included in this report for the reasons that some of them are still under treatment and the outcome is undecided, others have not finished treatment for a period of six months, and from a third group satisfactory reports have not been obtained.

Types Favorable for Serum Treatment—Group 1—Typical exophthalmic goiter in early stages, including the incipient, the mild, the severe, and those extremely severe forms which develop very rapidly and have been described as the acute toxemic type resembling malignant endocarditis.

It is in this group that we have had the largest percentage of complete success, the most prompt, and the most striking results. This is, perhaps, because in these early cases one is dealing with uncomplicated conditions which favor a specific treatment. It is interesting to note that those who favor operative treatment urge the desirability and even necessity of early surgical removal of the gland if the best results are to be obtained. The incipient and mild cases in young people generally yield promptly to serum treatment. It is probable that a large percentage of these two groups would improve by rest and careful hygienic treatment, and the administration of serum should not be a reason for neglecting these factors; but our experience has shown that serum can arrest these cases promptly. In some cases

* The statistics quoted in the first portion of the article are taken from the records of one of us (S. P. B.) and are from cases which have been for the most part treated under direction by physicians whose private cases they were. The statistics of the cases treated personally by Dr. Rogers are given at the end of the section on treatment.

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the entire clinical condition has been changed in a week's time and the symptoms of the disease were no longer discoverable. Patients having mild symptoms do not all recover under rest treatment, and the serum has been used in many of these cases with complete success, after the failure of other forms of therapy.

The simple soft goiters which often develop in young women from various causes are at times accompanied by mild symptoms of Graves' disease. Iodin in some form has been for many years the usual drug treatment of these cases, and in a considerable percentage with the happiest results, but some of them, which in the early stages may not be distinguishable from an incipient Graves' disease, are made worse by such treatment and may develop a typical condition of hyperthyroidism. The administration of thyroid to such patients is occasionally of benefit, but whether given as a means of therapy or for the purpose of establishing a diagnosis, thyroid should be given in very small doses and the effect on the patient carefully observed. This matter will be referred to at a later point in the paper. For these two groups, the incipient and the mild, the serum need not be highly active and may be given at intervals of three to five days. In most of these cases a prompt result may be expected.

We have included in this subdivision the very severe, rapidly developing cases which have many of the characters of an acute infection. This type forms only a small percentage of the total number of cases treated, and yet it is in many respects the most interesting. The very marked improvement caused by the administration of a small amount of serum is quite comparable to the effects seen in diphtheria following the administration of antitoxin. In no other group of cases is the toxemic character of the disease so well shown, and it is precisely with these cases that we have had the most convincing clinical evidence of the antitoxic action of the serum.

The recently developed severe cases take the serum with less reaction than the milder cases, and they may in the beginning take more of it. In some instances we have given a small dose every twenty-four hours until four injections have been given and then have increased the interval to two days. It is necessary to watch the patient carefully for unfavorable reactions, and the serum must not be forced in the presence of marked local and general reaction. The rapid development and great severity of these cases is a bar to surgical removal; the failure of general measures is

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in sharp contrast to the success of the serum treatment and is, in our opinion, one of the best arguments that can be advanced regarding the nature of the disease and the mechanism by which the serum causes improvement.

The majority of the patients in the first group progress very favorably and many of them recover entirely, which means that all symptoms disappear, under doses of about 0.5 c.c. of an active antiserum given at first as often as the reaction permits and then gradually increasing the interval between injections up to five or seven days. In some cases, however, a small dose of antiserum, 3 to 5 minims, not enough to produce any reaction, given once every twenty-four hours for two or three weeks, will sometimes act better. The best of hygienic surroundings are necessary throughout the treatment, and these, it should be said, are not possible in a public hospital ward, with its attending excitement and often distressing circumstances. In some cases a long time is required to effect a cure or even much improvement, and this means an average of two or three months of antiserum treatment and six months more of restful vacation under constant observation.

Exophthalmos and goiter are the last symptoms to disappear, and as long as the latter persists there is some danger of the recrudesence of symptoms under mental or physical strain. The longer a patient remains free from thyroidism, even with a persistent goiter, the less likelihood there seems to be of the recurrence of the disorder. Some kind of infection, generally tonsillitis, is one of the troublesome causes of accidents and exacerbations. While the entire disappearance of the goiter is a result to be earnestly desired, in the majority of cases it can not be obtained quickly by the serum treatment, and as soon as the more distressing symptoms have subsided it is wiser to reduce the serum gradually and depend in part on hygienic and tonic measures. Occasionally, in the latter stages of the recovery, very small doses, 1/50 or less of a grain, of thyroid proteid act beneficially. If commercial thyroid is used, doses of not more than ¼ of a grain should be given and the effect very carefully watched.

In giving the statistics we have divided the cases into three groups, distinguished by cure, improvement and failure. In order to give an intelligent idea of the results it is necessary to define these terms, and this is particularly necessary because reports in the literature show widely varying conceptions of the

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term "cure" as applied to the treatment of this disease. By a "cured" patient we mean one in whom the subjective symptoms have been entirely relieved and the objective symptoms have subsided to such an extent that nothing more than a gland discoverable only by deep palpation remains. The majority of the improved patients still have a small goiter, but with most of them the subjective symptoms have been relieved, and the patient has been made comfortable and able to work and act in nearly all respects like a normal human being. It is worth noting that with some of the improved cases the improvement continues slowly, although the treatment may have stopped for a year or more. The failures are those cases in which the treatment has produced no beneficial effect.

Of the total of 141 cases reported, 52 belong to the first group of the classification. Of these, 18 have been cured, 28 improved (all but 2 being very much improved) and 6 have failed to improve. Of the 6 failures, 3 cases resulted fatally. It should be stated here also that 6 patients properly belonging in this group have applied for serum, which was forwarded as promptly as possible, but in the interval the case terminated fatally before the serum could be given. Such sudden terminations are likely to happen, especially in the very acute form of the disease. Of the three fatal cases listed with the failures, two received only two injections of serum and the third received only one injection. They were of the same acute type as the six cases which terminated fatally before the serum was received. It is impossible to include in a paper of this sort a case history for each patient treated, but the details of a typical cured, an improved and a fatal case are appended herewith:

CASE 1.—*Cure*—S. H. C., a woman, 39 years old, always well except for attack of grip nine weeks before the development of thyroid symptoms.

Signs and Symptoms—This was a typical acute case, with marked tachycardia; the patient was very nervous, had marked tremor and diarrhea, perspired freely, had troublesome thirst and did not sleep well. Her skin was markedly pigmented; she had marked exophthalmos and a small soft goiter gradually increasing in size. The symptoms of the disease were on the increase; the patient has emaciated somewhat but she is able to be up.

Treatment—The patient was seen by two prominent clinicians who pronounced it a typical acute case and advised serum treatment. Previous to these consultations she had been treated with rest and tincture of belladonna without beneficial effect.

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Result—The patient was under serum treatment from March 20 to August 31, and continued to improve steadily. The final report received in December states that the very best results were obtained. The gland was normal in size, tachycardia entirely absent, the exophthalmos cured and the patient stouter than she ever was before and feeling perfectly well. Her color was good, and the appetite and digestion as good as they ever were in her life.

CASE 2.—*Improvement*—R. M. V., a woman, aged 36, married, weight 163; had pneumonia at 17, otherwise healthy.

Signs and Symptoms—Symptoms first noticed about a year before the treatment began and the patient had lost 94 pounds in weight during this time. The pulse was 108 when the patient was in bed and quiet, of fair quality and regular. The heart was dilated, the apex-beat being one and one-half inches to the left of the mid-clavicular line, faint systolic blow at the apex. The patient was very nervous with marked tremor; perspired freely. She had fair appetite with no vomiting or diarrhea at the time treatment was begun. She was always thirsty. The circumference of the neck at greatest point was fifteen inches; a soft goiter of moderate size.

Treatment—Before serum treatment the patient had been receiving iron, tonics, digitalis and Merck's antithyroidin, but the condition had been stationary for some months. The patient was confined to bed. Treatment was begun in April and continued until September.

Result—The patient recovered in nearly every particular. There was no noticeable exophthalmos; the goiter could scarcely be seen, but could be felt by careful palpation. The nervousness and tremor were entirely gone. The patient now did her own work and her pulse ran from 84 to 90 after a day's work. There was no systolic murmur and the heart was not dilated. The patient feels perfectly well.

CASE 3.—*Failure*—I. W. K., a woman, 27 years old.

Signs and Symptoms—This was a typical case with rather slow onset, pulse ranging from 180 to 200, heart symptoms very marked, precordial pain, loud systolic blow, heart dilated, apex-beat displaced to the left two and one-half inches. The patient had a hacking cough; her voice was somewhat husky, moderately nervous, with a fine tremor. She slept badly, perspired profusely and had a troublesome thirst. The exophthalmos was moderate; the gland varied in size, at times being small and hard and at others large and soft. There was extreme emaciation, the patient had been in bed three weeks and was very ill when the injections were begun.

Treatment—This was begun on December 29. Three injections were given by January 4, on which date the patient died.

Result—There did not seem to be any reaction in either way to the serum.

CASE 4.—*Marked Improvement with Sudden Death Later*—This case is very interesting and is included because the manner of death is typical of some of the acute cases. P. J. D., a young woman, aged 19, single, history of Graves' disease extending over two and one-half years. The onset of the disease, occasioned by a severe fright, was rapid and progressive.

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Signs and Symptoms—The pulse was 148 and fairly regular; the chest bulged at each pulsation; there was some precordial pain: no heart murmurs; the heart not dilated. Respirations were 27 per minute; there was a slight cough; the voice quite clear. The patient had until recently perspired profusely; her appetite was fairly good and there was no diarrhea. Menstruation had been interrupted for nine months. The patient had become reduced from 145 pounds to 75 pounds in weight. She sat up, but the condition had remained stationary for some weeks. The patient was very nervous with marked tremor.

Treatment—Up to a month previous to the beginning of the serum treatment the patient had been given thyroid extract. Treatment by serum was given from November until the following June. The patient began to improve immediately after beginning serum and continued to an almost complete recovery.

Result—The following report of the patient's condition on September 13 was made: The patient weighs 144 pounds, is able to walk several miles without fatigue, has been doing all the housework for several weeks past. Exophthalmos is noticeable but not marked. Heart is regular, 94, no murmur. The patient is not nervous and has no tremor; sleeps well; bowels and menstruation regular.

Outcome of Case—The patient died suddenly on October 28 after having had a severe pain in the head for a few hours. There was no autopsy.

Types Favorable for Serum Treatment—Group 2—Typical exophthalmic goiter in cases which have existed for some time in subacute form with occasional exacerbations but without marked secondary changes.

These cases are, as a rule, amenable to serum treatment, but there is generally not such rapid improvement, and the injections must be continued over a longer period than with the acute forms. In some instances in which the serum has been begun during the period of exacerbation there has been almost immediate relief, in this respect resembling the acute conditions, but permanent results were obtained only after some months. The longer the duration of these cases the slower the patients are to show permanent improvement, but, since we have had complete success with some cases of ten to twelve years' duration, we are led to the conclusion that it is the point to which the disease has progressed rather than the number of years of its course which is the determining factor. If treatment is begun during an exacerbation it should be carried out in much the same manner as with the preceding group, that is, the early acute cases, but it will probably be necessary to continue administration of a weak serum at intervals of five days to two weeks for some months before normal, stable equilibrium is attained.

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Of the total of 141 cases reported, 70 have been in this group. Of this number, 16 has been cured, 36 have been greatly improved, and there have been 18 failures, 5 of the latter being fatal. Six patients properly belonging in this group have had a preliminary course of serum treatment and have later been operated on. Three persisted in the serum treatment for a sufficient time to give it a fair trial, with the result that one of them was much benefited and later was entirely cured by operation, while with the two others no decided benefit was obtained and operation, undertaken later, was fatal. The 3 remaining in this group of 6 did not persist long enough in the use of serum to permit any conclusion as to its value, and the subsequent operation proved fatal in each case. The three cases first mentioned as having had serum for some time are included in the list of 141 cases, one as improved and two of them as failures. The outcome of the operation in the 5 fatal cases can not be ascribed to the preliminary use of serum. Case histories of typical cases occurring in this group are given below.

CASE 5.—*Cure*—Mrs. B., aged 44, marked case with history of six years of chronic thyroidism.

Signs and Symptoms—Pulse 148, irregular; heart dilated, apex 5½ inches from midsternal line; patient very nervous, marked tremor; slept very badly; troublesome thirst; skin pigmented; moderate exophthalmos; irregular menses. Patient emaciated; weight 106 pounds; gland small but firm. Patient confined to bed.

Result of Treatment—Treatment was given from February to September. In November her physician reported that he considered the patient cured. Her pulse averaged 74; the thyroid could be felt on deep palpation; the patient was not nervous and had no tremors. Exophthalmos could not be detected. The patient weighed 132 pounds, felt in fine spirits, was doing her own work and as far as could be detected was perfectly well.

CASE 6.—*Cure*—Mrs. H., 54 years old, member of a highly nervous family.

Signs and Symptoms—The patient was very excitable and nervous, melancholic at times; had attacks of cardiac dilatation and it was necessary to use morphine to relieve pain about the heart. There was very marked exophthalmos, progressive enlargement of the thyroid, very marked tremor, temperature from 99 to 100, great prostration, and pulse 110 to 140 per minute. The patient's condition was grave for several months. She was under medical treatment for three months and at times showed some symptomatic improvement, but nothing permanent.

Result—The patient was under treatment for six months. At first she made slow but certain improvement, which has continued progressively, and at the time of the report, two years after beginning the treatment, the

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patient was well. There was no exophthalmos and no tremor; the patient was not nervous; the pulse was 84, regular, and of good quality; the thyroid could barely be made out, and there had been a great gain in weight, the patient now weighing 175 pounds. The physician considered her completely cured.

CASE 7.—*Improvement*—Mrs. C. F., aged 46.

Signs and Symptoms—The patient was extremely nervous; had very marked tremor; slept wretchedly; had troublesome thirst and diarrhea at times. The pulse was 120 to 160; there was pronounced exophthalmos; the gland was only slightly enlarged. The patient had lost 59 pounds, was just able to be up a short time during the day and had lost control of the rectum. She had been very nervous for 12 years, and the physician spoke of her as hopeless.

Result—Treatment was given from May until October. A great improvement was effected. The pulse was from 80 to 90; the tremor was almost completely gone. The patient made a gain of 30 pounds in weight during this time, was not nervous and slept well. The rectum was under perfect control. The patient was doing light housework and complained of nothing but occasional palpitation on climbing the stairs, but there were weeks when this was not noticed. There was distress at times from flatus in the stomach. Exophthalmos was still noticeable, but not nearly so marked. The size of the gland was about the same. A later report states that the improvement has continued.

CASE 8.—*Improvement*—Mrs. I., aged 38, had goiter for twelve years, gradually increasing in size. During the last three years the symptoms had gradually been growing worse.

Signs and Symptoms—The goiter was large, firm, low down on the right side; there was little exophthalmos, marked tremor, pulse when quiet 110, no heart murmur and marked dyspnea on exertion. The patient was very nervous, perspired very freely, did not sleep well and had a variable appetite with occasional diarrhea.

Result—The patient was under treatment from February to August. There was not much diminution in the size of the gland. The dyspnea was entirely relieved so that the patient was able to do her own work and go out walking for a long distance, which she had been unable to do for years. The heart came down to 80, nervousness and perspiration were entirely relieved, and the patient improved so much that she discontinued treatment.

CASE 9.—*Failure*—Mrs. M., aged 54; first symptom noticed in 1896. The patient suffered from nervous strain and worry immediately preceding the acute attack.

Signs and Symptoms—The pulse was 108; there was precordial pain and systolic murmur over the base of the heart. The patient was not nervous and had no tremor; slept fairly well and had a fair appetite. She had a small soft goiter and slight exophthalmos; had lost considerable weight. The most troublesome symptoms were vomiting and diarrhea, also edema of the face and hands. (Diagnosis was questionable.)

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Result—The patient was under treatment from May to October. The serum relieved the gastrointestinal symptoms very decidedly, and the patient was for a time very much improved.

Outcome of Case—The heart did not improve much, however, and later it steadily grew worse and the patient died in a fatal attack of syncope.

Types That May Require Combined Treatment—By the combined treatment we mean the administration of both the antiserum and a pure thyroid proteid. The administration of these substances need not be simultaneous, since at one period, generally the beginning of the treatment, the use of antiserum gives the best results, and at a later period the additional administration of a small amount of thyroid proteid is necessary to continue the improvement. If the case presents fairly typical symptoms of Graves' disease, we begin by giving small doses of serum, and in many cases find this treatment followed by very satisfactory relief, but if the serum causes very severe or disagreeable reactions and if there is no corresponding improvement in symptoms we begin the addition of small amounts of thyroid proteid.

In a considerable number of these cases it has been our experience that the administration daily of a small amount of thyroid proteid, three doses of one-fiftieth of a grain, and the injection of a small amount of serum, 5 minims, every fifth day gives the best results. It is not easy to understand precisely why this is true, since it is paradoxical to believe that a hypothyroid condition exists in the same patient that has symptoms of hyperthyroidism. It may be that the thyroid proteid from a normal healthy animal answers the physiologic need of the patient for such a secretion, while the abnormal product from the patient's own gland is neutralized by the use of serum. It is certain that the serum does not neutralize the physiologic action of a sheep thyroid proteid; so that in effect we may, by giving serum and the proteid from normal sheep thyroid simultaneously, substitute the action of the normal secretion from the animal for that of the abnormal secretion from the patient's gland. Whatever may be the explanation, the clinical fact remains that some of these mixed cases improve more rapidly and surely by such a method of mixed treatment.

It is impossible to formulate precise rules to be followed in administering serum to this group of patients, for the reason that the type and clinical conditions are so variable, but from a study of the case we may be able to decide whether the symptoms are

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a manifestation of hypothyroidism or hyperthyroidism, and the beginning of the treatment should be made in accordance with these conclusions. In my opinion, the logical treatment for the group of mixed cases is the combined treatment, as it combats the dysthyroidism, which is probably an essential factor in the production of the symptom-complex. The treatment of the atypical and the advanced typical cases requires a finer discrimination and more accurate judgment in the employment of antiserum and thyroid preparations than is needed in the treatment of typical cases which form our first group, and it must be admitted that some degree of experimentation must be made with some of these patients before the most suitable treatment is determined on. Complete recovery is slow, but encouraging improvement is often noted in a comparatively short time.

Before we can give treatment intelligently in cases belonging to this group a very careful study must be made of the past history of the disease, the symptoms and the clinical condition in order to determine, if possible, whether the hypothyroid or the hyperthyroid effects predominate, for our therapeutic efforts will be regulated accordingly. The manifestations of these two conditions are so complex and our means of diagnosis so incomplete that we can not always decide in which group a given patient belongs. In most instances it is possible to classify the case, but occasionally we find one of a mixed type that is very difficult to explain.

It will be noted that we have included under the group that may need combined treatment the atypical cases and cases of those patients who develop thyroidism comparatively late in life. The patients in atypical cases are not necessarily advanced in years, many of them being under 30, and the typical patients over 50 do not all need combined treatment, so that the factor of age can not be the criterion by which the matter is decided.

The cases belonging in the atypical group are much the most difficult to classify and treat. None of them have all the typical symptoms of Graves' disease, and the majority of them appear to suffer from an abnormal secretion rather than a pure hyperthyroidism. They have often come to us with the diagnosis of Graves' disease because they have at one time had a typical form of the disease, but as we see them they have passed out of that typical form to the mixed type and occasionally one appears to have a nearly complete myxedema. Such cases are not to be

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treated by serum alone. Surgery is equally out of the question or should be with most of them.

In order to bring the matter more directly in view we append a table of contrasts to show the differing symptoms of hypothyroidism and hyperthyroidism. For the hyperthyroidism typical Graves' disease is the best example, but for the opposite type we have selected the myxedematoid rather than typical myxedema in advanced stages.

Hyperthyroidism.	Hypothyroidism.
AGE.	
More common in young women, 18-30.	More common in advancing years, 35-50.
ONSET.	
May be slow and gradual or sudden and acute.	Slow and gradual, in many cases engrafted on an old Graves' disease.
HEART.	
Tachycardia 120-180; pounding beat felt over wide area; often a loud systolic murmur over apex, base and along the great vessels. Irregular and very susceptible to the effects of exercise. Blood pressure variable, generally low, pulse soft and full, marked dyspnea on slight exertion. Marked edema of legs.	Rarely above 100, may be irregular with heaving impulse. Pulse generally shows high tension and the blood pressure is above normal.
NERVOUS SYSTEM.	
Fine tremor affecting nearly all the muscles, twitching, and occasionally spasms. Patients are abnormally irritable and excitable, apprehensive, mentally *very* active and physically restless. Muscular weakness prominent.	Patient may have some tremor, and muscular weakness is likely to be very pronounced, but there is not the same restlessness and jactitation. Patients are occasionally irritable, but they are generally rather dull and apathetic, mentally slow; memory defective. Pains in joints frequent, and there is a marked tendency toward sudden giving-way of the legs when walking.
EYE SIGNS.	
Exophthalmos generally present, although it is not invariable. Occasionally unilateral, corresponding to the side having the enlarged thyroid lobe. Various symptoms arise in consequence of the exophthalmos. No pupillary changes.	Exophthalmos is unusual, although it may have been present at one time.

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GLAND.

Enlargement varies from nothing to very large goiter. The blood vessels over the gland are generally much enlarged and pulsate markedly. Right lobe generally the larger.	Often no enlargement can be made out; when there is a goiter it has an elastic, rubber-like consistence, occasionally cystic and nodular, but very distinctly different from the active, pulsating gland of Graves' disease.

NUTRITION.

Severely disturbed; in most cases there is a loss in weight, which may progress to extreme emaciation. Appetite variable; vomiting and diarrhea frequent complications. Patients drink a great deal of water.	Generally not seriously disturbed; patients hold their weight and in most cases gain slowly; constipation rather than diarrhea, and flatulency a troublesome habit. Patients do not drink much water.

SKIN.

Profuse perspiration, erythema, urticaria, dermographia; pigmentation, which may occasionally be so marked as to suggest Addison's disease. Hair falls out, but is not coarse and dry. Patients prefer thin clothing and cold rooms. They are more comfortable during cold weather than during hot weather.	Dry, may be scaly; patients do not perspire on exertion; hair dry, brittle, scalp scaly. Pigmentation not common. Patients prefer thick warm clothing and are cold most of the time. Much more comfortable during hot weather.

TEMPERATURE.

May be only slightly elevated, 99-100. With severe acute cases it runs often to 102-104.	Subnormal, may reach as low as 95.

URINARY FINDINGS.

In most cases normal in volume; glycosuria not unusual; polyuria often observed in later stages. Nitrogen partitions show a very much decreased kreatinin excretion, while kreatin is present in large amounts. Nitrogen loss is marked during the period of emaciation.	Albuminuria not unusual. Nitrogen partitions do not show so marked a disturbance in kreatinin and kreatin ratios. In large number of cases urine practically normal.

BLOOD.

Hemoglobin low, leucopenia in severe cases, with a marked relative lymphocytosis.	Hemoglobin low, white blood count normal.

MENSES.

Very irregular or completely suppressed.	Generally regular but scanty.

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The atypical cases do not fall sharply into one or the other of these groups, but show most unusual combinations of symptoms of pure Graves' disease with those of myxedema. The existence of such cases has been recognized for some years and their successful treatment with thyroid preparations is not new. It has been our observation, however, that a large percentage of these patients do not do well on thyroid extract alone, and that a combination of serum with thyroid proteid gives the best clinical results.

The statistics which are given under the last two groups do not furnish an accurate estimate of the prognosis in those types because we have used the combined treatment only during the last year and there are comparatively few who have finished the treatment for a period of six months. My list shows nineteen cases which fill this requirement, however, and of these ten have been greatly improved and nine have failed of improvement. There have been no deaths in this group and no patients have been cured. It is only fair to state that there have been four cured patients, but they have not finished treatment for a period of six months as yet and so they have not been included.

CASE 10.—*Improvement*—Miss H., aged 40, had had subacute symptoms for ten years.

Signs and Symptoms—The pulse was 120 to 140; respirations about 20 and labored; voice rather husky. The patient was rather nervous; had no tremor; could sleep only in a semirecumbent position; had a good appetite; had diarrhea, pronounced exophthalmos, a small soft goiter, and was slightly emaciated. Her condition was stationary for some time.

Results of Treatment—The serum was used for six weeks with some general improvement in the condition of the heart, but the gastro-intestinal condition was not relieved. During the next six weeks the combined treatment was given with the best results. The pulse dropped to 98, exophthalmos was much less, the diarrhea completely relieved, the thyroid much softer and almost normal in size. The patient slept well in recumbent position; was rapidly improving and felt equal to resuming her occupation as a teacher. At later report states that her satisfactory improvement has continued.

CASE 11.—*Improvement*—Miss N., aged 38; history of Graves' disease for six years.

Signs and Symptoms—The pulse was 120 to 130; there was slight precordial pain and tremor, especially pronounced in the hands and knees, and the appetite was poor. The patient was very nervous, slept badly and was troubled with diarrhea and sometimes with vomiting; had marked exophthalmos, a small hard goiter; was emaciated and not able to be up.

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Results of Treatment—Treatment was continued from May until October with the result that the patient gained 30 pounds in weight; pulse became regular at from 80 to 90; the appetite good; no diarrhea; menses regular; nervousness entirely relieved. "In short, her general condition is very good."

CASE 12.—*Failure*—Mrs. G., aged 56; history of goiter for twenty years, with symptoms of an atypical Graves' disease for eight years.

Signs and Symptoms—Patient was nervous; did not sleep well and had a poor appetite with occasional diarrhea. Pulse was from 90 to 100, regular and of fairly good quality. There was no troublesome perspiration or unusual thirst. The patient had had moderate exophthalmos in the past, but this symptom was no longer seen. Headache was a troublesome feature of the case. Temperature was normal.

Results of Treatment—The case was not considered a favorable one for treatment with serum, but it was begun cautiously and was carried out for some time with no benefit. Later the combined treatment was tried for a period of six weeks without benefit. Patient was no better in any way than at the beginning of the treatment.

The patients personally treated by Dr. Rogers to January 1, 1908, number 105, who presented, more or less markedly, the three cardinal signs of exopthalmos, goiter and tachycardia. Reports could be submitted on about one hundred additional cases, but, as they were mostly hospital or consultation patients whose records are incomplete or people who presented irregular and doubtful forms of thyroidism, it has seemed best to confine the report to those that have been personally treated throughout and to typical examples of exophthalmic goiter. There is thus no question about the diagnosis and it gives a clearer understanding of what has been accomplished for these sufferers.

Of the one hundred and five patients, twelve have been cured of every trace of disease, including both exophthalmos and goiter, seventeen have no symptoms of a pathologic nature whatever except a small goiter in a few instances, and one has a slight right-sided exophthalmos but no goiter. As neither of these abnormalities is noticeable without close examination, I (J. R.), think it is fair to group these cases together and state that a total of thirty have been cured.

Forty-three who have undergone specific serum or combined treatment have been improved and, while some of these are still under treatment, many of them are expected to be ultimately in the cured class.

Four have failed to show any benefit by specific treatment.

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Seven whose condition in several instances was at first greatly benefited by the antiserum have died from the natural progress of the disease.

Twenty-one have been operated on either before or after undergoing the specific treatment described below, with the result that none can be called a perfect cure, and two of these twenty-one have died as a direct result of the operation.

A brief analysis of the failures, the deaths and the operative cases presents much that is instructive. The four described as failures under antiserum received no other treatment and occurred early in our experience before we had grasped the importance of supplementary thyroid treatment at certain stages, or in certain forms of the disease. Nevertheless, in so complicated and obscure a disease it is only reasonable to expect a considerable percentage of failures for a long time to come, or until there is a much more definite understanding of the physiology of the thyroid than exists at present.

One of the most striking features in a survey of all the one hundred and five cases is the gravity of the prognosis, for, in spite of everything which could be done, there was a death rate in this comparatively brief period of observation of less than three years, of approximately 10 per cent. One gains the impression from the observation of many patients in different stages of exophthalmic goiter that the mortality under ordinary medical treatment is considerably higher than this. Indeed, the expectation of life after the onset of the symptoms in a well-marked case can not be more than ten or twelve years.

The best results occurred in the very severe acute or the early mild cases, especially if the goiter was small. The failures and deaths occurred in cases of marked severity with large goiters and after the disease had been manifest for several years or in patients who developed it late in life. There have, however, been some exceptions to these rules, as a few with small goiters have done poorly while others which appeared almost hopeless have progressed surprisingly well. Five women while in the improved class have gone through a normal pregnancy with continued gain, and all but one were delivered at full term of healthy children. Antiserum was given in three cases throughout the pregnancy; the other two were so well during this period that no treatment was required.

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Two of the five mothers can now be placed in the cured group, though one still has a barely perceptible goiter, but no other symptoms. The surviving children show no abnormality. In reviewing the histories of all the patients, however, the heredity was quite apparent in a considerable number of the cases. It was not unusual to elicit a more or less close family history of goiter and in a few cases of true exophthalmic goiter, but the proportion was not greater than in other diseases like tuberculosis, rheumatism or cancer.

Two patients presenting a well-marked though not particularly severe type of the disorder of several years' duration made an almost complete recovery after a few months of antiserum treatment. The exophthalmos, tachycardia and subjective symptoms entirely disappeared, but the goiter remained quite large, though softer than at the time of the first observation. During this period a considerable degree of rest, quiet and good hygiene had been enforced, but as soon as the patients felt well work was resumed, by one as a book canvasser, by the other as a tailor in a sweat-shop, and very soon thereafter during a time of hot weather and hard work, a combination which seems particularly trying, both patients relapsed. Antiserum seemed to do harm, prothyroid treatment was without avail, and the disease progressed gradually to a fatal termination which was preceded by stupor and coma.

A third patient had almost the same history, but by a careful use of antiserum and combined treatment, apparently with beneficial results, barely escaped death and has now no symptoms except of small goiter.

Of the twenty-one patients operated on three had only the superior thyroid vessels ligated. The eighteen remaining patients underwent the more radical and generally recommended operation of removal of a portion of the thyroid gland either before or after submitting to the specific thyroid medication. And these eighteen are the most important from a surgical standpoint.

Nine patients had been operated on and had relapsed before coming under observation, and some of them had reached a condition worse than that which had called for the interference. Three of these nine had each undergone two operations with no lasting benefit. Of the nine who relapsed after radical operation, four have been greatly benefited by the antiserum or by

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prothyroid treatment and might be called cured if sufficient time had elapsed to demonstrate that another relapse will not occur. Three have so much improved as not to be conscious of illness, although some tachycardia is still perceptible. One (who has had two operations) completely failed to improve in spite of careful treatment and is slowly but surely losing ground, and the other, who also had had two operations, failed entirely under the antiserum, and in July, 1907, suffered a removal of the second thyroid lobe, leaving only the isthmus. This, in November, 1907, was evidently enlarging, and, although the patient had after the last operation, as after the previous two, gained considerably in flesh and strength, both subjective and objective symptoms were very apparent, and she stated that she felt little, if any, better.

The remaining nine patients, after failing to improve under the antiserum treatment, suffered removal of one lobe and the isthmus of the thyroid gland either at the hands of Dr. Rogers or at those of other surgeons. Of these, two died of acute thyroidism (?) shortly after the operation. The first came under observation early in my experience with a very severe toxemic form of the disease, and when the antiserum was begun death seemed imminent. After two or three months of antiserum treatment she almost entirely recovered, but still had comparatively mild symptoms and a pulse rate of 110. In an attempt to complete the cure, the right lobe and isthmus were removed with a fatal result. The other death occurred in a psychopathic case with mild symptoms of Graves' disease and melancholic depression, with delusions of sight and hearing. Antithyroid and prothyroid treatment were both tried and seemed only to make the psychosis worse, so removal of one lobe of the much hypertrophied gland was attempted and a fatality followed within two days.

The seven remaining patients were all treated with antiserum with more rather than less unfavorable results, although five were at first greatly improved and then remained stationary or were made worse by the medication. I believe now, however, that with time and good hygiene and the judicious exhibition of the combined treatment, the advantage of which have only of late become apparent, much more could have been accomplished. Nevertheless seven patients, after failing to recover under antiserum treatment, had one lobe and the isthmus of the gland suc-

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cessfully removed, and the last operation on these cases was in October, 1907. Only three of the seven were much benefited by the operation. One who was operated on in November, 1906, remained comparatively well though unable to undergo vigorous exertion until February, 1908. The second patient, after gaining somewhat under antiserum, relapsed and had the left superior thyroid vessels tied and the right lobe removed in Stockholm in September, 1906. After this she gained slowly in flesh and strength and returned to this country, but suffered another relapse with typical symptoms in November, 1907. The third patient came under observation in July, 1907, and refused operation after appreciable benefit from the antiserum, especially in the very troublesome insomnia and weakness. He then left the hospital and relapsed in December, and in January, 1908, had one lobe and the isthmus removed, and, although much improved, still shows in April the characteristic symptoms.

The other four of the seven patients who underwent operation after failure with the antiserum are about as they were when first seen and at least two of them were for several days after the operation in a rather critical condition and convalesced to their original state very slowly.

These experiences, while not very extensive, have seemed to indicate that when antithyroid, or in very exceptional cases, prothyroid treatment fails, not much can be promised by radical surgery. Not only the danger but the uncertainty of the result of operative removal of part of the thyroid in exophthalmic goiter demands that until there is a more definite knowledge of the physiology and pathology of the organ, at least a trial should be made of the specific treatment.

According to these statistics about 30 per cent. of all cases under careful management can be practically cured and the earlier they come under treatment the better the prognosis. About 50 per cent. can be improved; some 20 per cent. have failed and of these 10 per cent. have already died. This includes all stages and varieties of the disease; the youngest patient was five years of age, and the oldest over eighty; many have been sent for specific treatment as a last resort and have been considered hopeless at the outset, but the inclusion of all patients without distinction so long as the diagnosis is unmistakable, is the only method by which a reasonable idea of the prognosis can be derived.

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The Reaction Following the Injection of Serum—The serum is always given by hypodermatic injection, and we have chosen the arm as the site of injection because it is more convenient for the patient and because the local reaction causes less trouble in this region and may be treated more readily. The upper arm just below the deltoid should be carefully cleaned and the injection made subcutaneously but not intramuscularly in order to avoid too rapid absorption. In 95 per cent. of the injections the local reaction consists only of an area of hyperemia and slight induration which may be somewhat tender on pressure for a few hours. It quickly clears up and in thirty-six to forty-eight hours the arm is perfectly normal. The indurated area may in some instances be three or four inches in diameter and occasionally the whole arm has become edematous from the shoulder to the finger-tips. Such a reaction is unpleasant, but fortunately it is a rare complication and if the arm is wrapped in a wet dressing the reaction subsides without unpleasant after-effects. The exact nature of the reaction in any given case cannot be foretold because the matter of personal idiosyncrasy of the patient is an exceedingly important factor. It is best, therefore, to start with a small dose and to determine the nature of the reaction in each case before the full therapeutic dose is attempted. As has already been stated, the very acute toxic cases take the serum better than the mild cases and with them it may be best to begin with a full dose. If the local reaction is marked it is best to keep hot applications on the arm for half to three-quarters of an hour after the injection, and gently massage the area about the point of puncture. Unless some quite unusual condition results no further treatment is necessary, for the condition subsides promptly. If a second injection is made before the reaction from the first has subsided a more decided reaction is produced in the second instance and the area of the first injection is again excited. The local reaction is therefore of value as a guide in the determination of dose and frequency of administration. The two arms should be used alternately as the site of injection.

The general reaction likewise shows considerable variation. In a large percentage of cases there is no disturbance whatever; there may be, however, a slight rise in temperature accompanied by nausea, some restlessness and perhaps some increase in the tachycardia. Rarely the patient may vomit and all the symptoms of the disease be temporarily exaggerated. If the serum is given

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too frequently or in too large doses both the local and the general reactions become more severe. The serum must never be pushed in the presence of a progressively increasing reaction. Serious consequences may arise if this precaution is not observed. If, during the course of treatment, an usually severe reaction has been obtained it is best to allow a somewhat longer interval before the next injection, and at the same time to reduce the dose.

During the last two years the study of the phenomena of anaphylaxis* and of the so-called "serum disease" has directed attention to the complications of serum administration. Several instances of severe reaction, some of them even with fatal outcome,† have been published recently and it is evident that serious consequences may occasionally arise. (None of the reactions to which reference is made have occurred in the use of the thyroid serum.) We have tried to avoid such possibilities by giving the serum in the first portion of the treatment at short intervals, that is, from one to five days, and thus avoid sensitizing the patient. In spite of these precautions we have had out of the several thousand injections that have been made in the course of the last three years, a few very severe, and, for the time, alarming reactions, although none have been fatal. These have been obtained in cases which have had the serum for some time and have occurred without any previous warning. (It is only fair to state that nearly all of the reactions occurred in the earlier part of our experience when we were using somewhat larger doses than we now find necessary.) These reactions have developed in most cases very shortly after the injection of the serum, but in a few instances the onset has been delayed for a couple of hours. They have always occurred in patients who have had some previous treatment with the serum. The reaction develops rapidly and resembles in some respects the condition recently described by Ohlmacher‡ as occurring in two cases treated with antistreptococcic serum. The cutaneous surfaces of the face became very much swollen, the nose, lips and ears were of twice the normal size and the exophthalmos was likewise much exaggerated. There has

* Rosenau and Anderson: A New Toxic Action of Horse Serum, Jour. Med. Research, 1906, xv.

† Gillette, H. F.: Diphtheria Antitoxin in Bronchial Asthma, Jour. Am. Med. Assn., 1908. Wiley, S. N.: Sudden Death from Injection of Diphtheria Antitoxin, Jour. Am. Med. Assn., 1908, l., 137. Boone, E. L.: Sudden Death Following Use of Diphtheria Antitoxin, Jour. Am. Med. Assn., 1908, l., 44. Quigley, I. K.: Collapse After Use of Diphtheria Antitoxin, Jour. Am. Med. Assn., 1908, l., 768.

‡ Ohlmacher, A. P.: Two Instances of Severe Non-fatal Serum Reaction, Jour. Am. Med. Assn., 1908, l., 875.

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been some subjective distress, particularly in breathing and the patient has become markedly cyanosed with a rapid, feeble pulse and a more or less pronounced syncope. The reaction is alarming for both patient and physician; but in our experience the condition has rapidly improved and an hour later all evidences of the attack may have passed off. We do not know why such a reaction should develop, but it is probably related to the phenomena of anaphylaxis. There is probably some peculiarly susceptible condition of the patient at the particular time the injection is given, for the patient may have taken the same serum previously without any marked reaction, and may continue to take it again for weeks without ever showing again a reaction at all like this. We have learned to combat these severe reactions with the hypodermatic injection of thyroid proteid, but their great infrequency makes it probable that very few physicians will ever have occasion to deal with them. Since we have given the serum in smaller doses at shorter intervals we have seen few disturbances other than the local reaction in the arm. Following such a reaction no serum should be given for a week and then a somewhat smaller dose should be given for the first injection. The serum produced in each animal varies somewhat from that of other animals so that it is necessary to know the character of the serum and the condition of the patient before the question of dosage can be decided.

The relation which the specific treatment bears to the surgical treatment is naturally of much interest. The list of one hundred and forty-one patients includes eight who have had some surgical procedure for the condition. Six of these cases have already been described. The two others are interesting as they both are instances of recurrence after operation; one of them is of especial interest as it is the first case in this country of a patient undergoing surgical treatment for the relief of Graves' disease. Brief histories of these two cases are given below:

Case 1.—Mr. F., aged 28, had the disease for eight years, operated on; had the right lobe, isthmus and part of the left lobe removed, "improving the fast pulse, exophthalmos and nervousness." Still had attacks of diarrhea and tremor; pulse was 109; the patient slept badly; had lost 35 pounds in the last three months and was unable to work.

Results of Treatment—The patient was under treatment for six weeks. Improvement began with the first injection; the tumor was greatly reduced, diarrhea cured, tremor greatly reduced, he can walk a good distance without undue fatigue. Has gained 27 pounds since the treatment began and is in every way much improved.

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CASE 2.—A woman of 34 years, weight 130, physical condition typical of Graves' disease, tachycardia of 116 to 140, heart otherwise normal, nervous with marked tremor, small goiter of medium consistence, increasing in size during the last few weeks.

History—This patient was the first to have removal of gland in this country for the relief of Graves' disease. The operation was done by Dr. A. C. Bernays in St. Louis, May 13, 1894. The right half of the gland was removed and the superior artery tied on the left side. The condition previous to the operation was serious, but the patient was entirely relieved and remained well during thirteen years following the operation. There was redevelopment of the disease in the spring of 1907. Her condition has been growing worse. Treatment by rest, ice pack and quinin hydrobromate had not improved the condition.

Results of Treatment—Ten injections of serum were given; the first caused a marked reaction, the second much less, and it gradually decreased to no reaction whatever, "and with this the pulse kept growing slower, she gained in weight, the goiter grew less, and every symptom gradually disappeared."

To summarize these cases again, it will be recalled that five patients tried serum first without benefit and later died as a result of operation, two were operated on before the serum treatment with good result and were later treated successfully with serum for a recurrence of the disease, and the last was benefited considerably by serum treatment premliminary to a completely successful operation. As far as these figures go it would seem that if a case can not be benefited by serum it may be dangerous to operate; and also that, if an operation is likely to be successful serum may also be successful. It appears to be true that the type of case which can be completely cured by operation is a type favorable for serum treatment.

It must not be understood that what has been said above is a criticism of or an argument against the operative treatment. The few brilliant operators who have had sufficient experience to select the cases intelligently, give the proper preliminary treatment, and carry out the operative procedure with the requisite skill and judgment have had very good results and their statistics speak for themselves; but the fact remains that for the majority of surgeons the operation gives a high mortality and not fully satisfactory postoperative results. Moreover, I think the time has not yet come to determine precisely what the results of operative procedure are to be. Surgical removal of the thyroid for Graves' disease can scarcely be considered an emergency operation, and in my opinion should not be undertaken unless the

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operator is thoroughly familiar with disease, and has had his judgment tempered by a wide experience.

Graves' disease is a serious malady and should be so regarded. The fact that incipient cases in young women will in most cases improve promptly with rest and tonic treatment is a cogent reason for early recognition of the condition, but even in early cases there are many that do not terminate so happily but continue to progress toward an acute development of hyperthyroidism. Again it is often found that the rest cure is only temporary and that as soon as activity is resumed the serious symptoms again appear. The earlier symptoms may not be such as to disturb the patient and she may be thought merely nervous. In many of our cases the condition has been first noticed by the patient's friends or by the physician at a time when the patient feels perfectly well. The analogy between Graves' disease and health urged by Putnam* is of considerable importance. He says:

It is, of course, impossible from the data at our disposal to determine the precise value of the serum in the treatment of hyperthyroidism. I believe that as far as numbers are concerned an equally large series may be shown which have done as well or perhaps better on purely medical treatment, but the type of case counts for everything. Practically all of the first one hundred patients and at least 75 per cent. of the remainder have used the serum only as a last resort after having tried rest, tonics, thyroidectin, and a great variety of medical measures without relief. In many such cases when the gamut of general therapy has been run the serum has been given with the most striking and immediate benefit. In the majority of cases, however, the improvement, although positive and undoubted, has been slow and gradual, perhaps requiring six to eighteen months for the final complete recovery. This is not in any way unusual, since recovery after surgical removal of the gland is in many cases slow, requiring one or two years.

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* Putnam: Clinical Aspects of the Internal Secretion, Tr. Cong. Am. Phys. and Surg., 1897, iv., p. 122.

The symptoms of Graves' disease shade off, if one studies a large number of cases, into the phenomena of health. The tremor, the rapid and excitable pulse, the flushed skin, the restlessness of mind, are seen almost habitually in many persons who are simply called nervous, and these symptoms and more, including the staring gaze, may come on suddenly, even in a presumably healthy person, under the influence of a strong emotion, which may be called either a disease or a quasi-physiological state. . . . I will repeat in conclusion that the importance of the analogy between Graves' disease and health is urged, not as an exclusive theory, but as one profitable mode of regarding the subject.

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Conclusions.

This work is the first attempt to treat disease in the human subject by means of a specific cytotoxic serum, and our own conclusions, subject to revision as experience increases, are as follows:

1. The serum has a specific effect in neutralizing the toxic action of the thyroid secretion.

2. As a therapeutic agent it gives results which can not, in many cases, be attained by any other medical means.

3. Not all cases presenting symptoms of thyroidism can be treated successfully with serum, because not all cases are purely hypertrophied in origin.

4. The rapid amelioration of symptoms in the acute toxic cases, similar in most respects to the well accepted instances of neutralization of toxin by antitoxin, is a weighty argument in favor of believing the symptoms to be due to the toxic effects of hyperthyroidism.

5. The beneficial results of combined treatment, especially in the older cases, indicates a *dysthyroidism* as well as *hyperthyroidism* as a factor in the production of symptoms.

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AN UNUSUAL CASE OF GENERALIZED TUMOR OF THE LYMPH-NODES.

By Thos. Flournoy, M.D., *Pathologist.*

(*From the Pathological Laboratory of Bellevue Hospital.*)

The autopsy on this subject and a large part of the subsequent work was done by Dr. Norris, to whom I am indebted for permission to publish the case.

The clinical history is somewhat meagre, the patient being a German who spoke and understood little English and was almost aphonic on account of certain throat conditions. Patient entered the service of Dr. Bryant, of Bellevue Hospital, December 31, 1906. Dr. Bryant has very kindly given us permission to present the clinical history.

The patient was a male, 45 years of age. The family and previous personal history were negative. For fifteen years he had been employed in a grocery store. About two years ago, while in Harlem Hospital on account of a broken arm, there were removed from the right side of his neck several enlarged glands which he had first noticed about three months previously. Subsequent to this operation the remaining glands in the neck became enlarged, as did also the inguinal lymph-nodes, though these latter in time again became small.

Three months after operation he became hoarse and had difficulty in swallowing. These symptoms increased gradually, but with periods of improvement.

About a year ago he entered City Hospital because of dyspnœa. His legs at that time were swollen, and the glands in the neck were large and were considered inoperable. A tracheotomy was performed, evidently to relieve his dyspnœa.

Little reliance can be placed on the clinical history for the reason that, when his history was taken by another person, he admitted that he had enlarged glands in the neck for five years and said that he had been operated upon at the Presbyterian Hospital. Unfortunately there are no records of his admission either at the Harlem or Presbyterian hospitals.

His chief complaint when in the hospital was weakness, dyspnœa and swelling of the legs. There were present two scars, one from a curved surgical incision on the right side of the neck, and another in the

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median line as a result of the tracheotomy incision. Large, firm nodular masses extended from the ear to the clavicle on the right side of the neck, and similar masses (smaller in size) were present on the opposite side of the neck. The right axilla was occupied by a large mass of nodes. In the opposite axilla the nodes were smaller but palpable. A small subcutaneous nodule was present near the right nipple.

Enlarged glands were present in both Scarpa's triangles; those on the right side were larger. The liver extended below the arch of the ribs, and the area of splenic dulness was large. The upper half of the abdomen was distended by an indefinite tumor mass. The left elbow was partially ankylosed, and the muscles of the upper and lower arms were atrophied from disuse. The left leg was œdematous.

Urine—Negative.

Blood Examinations—Revealed nothing noteworthy.

A provisional diagnosis of alveolar sarcoma was made from a specimen removed from the neck. The subcutaneous nodule near the right nipple was removed, and on examination the diagnosis of endothelioma was made by one of the leading pathologists in the city, Dr. Norris being at that time unwilling to express an opinion. Patient died January 31, 1907.

The post-mortem examination was made on February 2, fifty-six hours after death. Only the chief features of the examination need be given here:

The body was that of a large male, 6 feet ¾ inch in height. On account of certain appearances suggesting acromegaly, more especially the form known as the *type carré*, careful measurements were taken of the skull and face, hands, fingers and feet. In general, these indicated uniform enlargement of the fingers, especially of the right hand, and of both big toes. The significance of the enlargement of the right hand was, however, rendered difficult of interpretation on account of the existence of the old fracture of the left arm, with atrophy of the muscles. The superior maxillary bones were enlarged and prominent. The lower jaw, nose and lips were normal in size. Tongue, however, was large and broad, measuring from the epiglottis to the tip, 12 cm.; in breadth, 6.5 cm.; in thickness, 3 cm. The ears were symmetrical, very large and thick.

The abdomen contained several liters of clear fluid. A tumor mass weighing 1,780 gms. was found in the upper median portion of the abdomen, displacing the stomach downward.

The left chest was filled with fluid and the lung collapsed. The right lung was voluminous, bronchi containing mucopurulent exudate. Two of the bronchial lymph-nodes were 4 to 5 cm. in length and infiltrated with tumor growth. The mediastinum was

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normal, with the exception of one small infiltrated lymph-node. Thymus was absent.

The parietal pericardium was thickened and opaque, and showed small raised nodules near the reflexion of the sac.

Heart—Large; both ventricles hypertrophied. The mitral and aortic valves were slightly thickened. The aorta and vascular system presented no noteworthy lesion.

Liver—Weighed 1,580 grammes. There was a moderate perihepatitis, with adhesions, and two small, firm whitish nodules about 3-4 mm. in diameter, were present beneath the capsule.

Spleen—Small, fibrous and firmly adherent to diaphragm, stomach and tumor mass. On its anterior border was an area of scar tissue which contained chalky material.

Kidneys—Normal in size and appearance. Except for a large, left-sided varicocele, the genito-urinary tract was normal.

Suprarenals—The left suprarenal was large and firm, and contained a number of tumor nodules of varying size in the cortex and medulla. The right suprarenal was normal.

Tonsils—Normal.

Tongue—Base of the tongue was somewhat glassy and smooth.

Pharynx and Larynx—Normal.

Stomach—There was thickening of the muscular layers at the pyloric end of the stomach, and about 2 inches from the pylorus there was present a large, teat-like process with umbilication at the apex. This was found to be composed of the greatly thickened muscular coats.

Small and Large Intestines—Normal, except that on the posterior serous surface of the rectum there was a large whitish area resembling inspissated purulent exudate.

All the cervical lymph-nodes, especially on the right side of the neck, were greatly enlarged and infiltrated, forming packets which were adherent and continuous with the tumor mass occupying the right lobe of the thyroid gland.

The treachea and œsophagus and the large vessels of the neck were practically imbedded in the tumor mass and were compressed.

The left thyroid lobe was large but not involved. The right lobe, as referred to above, except for a few areas of normal thyroid tissue, was completely infiltrated.

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The right axilla was almost completely occupied by large packets of lymph-nodes; several of the femoral lymph-nodes on the right side were enlarged, the largest being about 3 cm. in length.

The tumor mass in the abdomen completely surrounded the pancreas, but the organ itself showed no involvement. The individual nodes were very large, firm and adherent. The section was whitish, mottled with hemorrhagic foci.

The aorta and inferior vena cava, which passed through the tumor mass, were greatly narrowed from compression.

Mesenteric nodes were small and yellowish in color and not involved.

A striking picture was presented by the mesentery of the jejunum and upper ileum, upon which were situated a large number of small raised foci varying in size from a pin-point to the head of a small hatpin. These nodules were yellowish-white in color.

The lacteals of the lower part of the small gut were injected and were the seat of small, whitish, dry and homogeneous foci.

Brain—The brain presented no gross lesions, except atheroma of the vessels and a small aneurysmal dilatation of the left vertebral artery. The sphenoid sinus contained thick, greenish-yellow purulent exudate. The middle ears were normal. The sella turcica and the pituitary gland were normal in size. On the inferior surface of the gland a small, whitish nodule, 2 to 3 mm. in diameter, was present. This nodule was made up of tissue resembling in structure the neural lobe of the gland.

To briefly recapitulate: The case in its clinical aspects suggests a lympho-sarcoma. Anatomically it likewise resembles a lympho-sarcoma, the lymph-nodes involved being the peripancreatic, cervical, axillary and femoral.

This diagnosis is, however, not borne out by the histological structure of the tumor, which presents none of the characters of a lympho-sarcoma or of a Hodgkin's or pseudo-leukæmia. No primary tumor was made out, although the involvement of the right lobe of the thyroid and the left suprarenal suggested such an origin. The possibility of a primary focus of growth in one of these organs may be eliminated, first, by the histological structure; second, by the anatomical picture presented—namely, generalized lymph-node involvement of widely separated groups of nodes, without involvement of the viscera. (It may be stated

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here that the small nodules beneath the capsule of the liver were not neoplastic in origin.)

Two distinct histological pictures may be made out. The first was presented by all the infiltrated lymph-nodes; the second was quite distinct from the first, but presented alone by the thyroid gland.

The structure of the predominant type of tumor is distinctly alveolar and non-vascular. The septa vary in thickness, in some places being broad bands of fairly dense connective tissue, in other places being delicate connective tissue fibrillæ with prominent nuclei. This latter appearance is especially well seen in the smaller alveoli.

The alveoli are in the main filled with closely packed cells having large round or oval nuclei containing little chromatin. The protoplasm of the cells stains poorly, is homogeneous and abundant. The cell outlines are indistinct and in places appear to be directly continuous with the stroma, which is in places distinct.

Although this description applies to a large number of the lymph-nodes examined, a few show marked differences which must be referred to. In places where the tumor is more actively growing, the growth tends to lose its alveolar character, although the connective tissue septa are broad and hyaline. The large alveoli in such nodes show a peculiar picture, the central portion being made up of apparently necrotic material; that is, of cells staining deeply with eosin and having pyknotic nuclei and chromatin dust.

The layer of tumor cells bordering this portion is compressed and fused, forming a narrow line of demarcation beyond which the tumor cells not only show no evidence of compression, but are unusually large and protoplasmic. The stroma about this type of nodule is extremely scanty and shows numerous small lymph-spaces packed with tumor cells; in fact, the tumor seems to have every resemblance to an endothelioma.

The tumor nodules in the left adrenal show practically the same structure as do the tumors in the lymph-nodes, the masses of cells being packed in alveolar spaces of various sizes. In this organ, however, there are masses which stain a bright red with eosin and with Van Gieson's stain exhibit a deep orange. With the other anilin dyes and in iodine solution, no amyloid reaction was obtained in celloidin sections. The character of this material

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is uncertain, although it presents striking similarities to amyloid or to a hyaline substance with a peculiar staining reaction.

The tumor situated in, or replacing the right lobe of the thyroid gland, presents a structure different from that described above. This tumor is composed of closely packed groups of cells in alveoli of different sizes. The connective tissue framework is in places abundant, the stroma finely fibrillated and œdematous, containing numerous fibroblasts. In many places it is infiltrated with small round cells. The outlines of the tumor cells are ill-defined, the nuclei of the cells are large and oblong in shape and tend to arrange themselves in concentric striæ, somewhat resembling epithelial pearls. The centra of the larger alveoli are occupied by an eosin-staining material, broken-down cells, and chromatin dust. The thyroid tissue has been completely replaced.

The nodules on the mesentery of jejunum and ileum are inflammatory in character.

The area on the rectal serosa consists of an exudate with large round or ovoid cells and a few plasma cells and leucocytes. A few Gram-staining bacilli were found in the sections.

The case we have described is therefore a tumor involving the peripancreatic and retroperitoneal lumbar-lymph-nodes and the left suprarenal. All the cervical nodes are greatly enlarged and infiltrated, likewise the right submaxilliary gland, the right lobe of the thyroid and the axillary lymph-nodes on both sides. The lymph-nodes in the chest, except for two large bronchial and one mediastinal node, were not enlarged. Except for a few nodules on the diaphragm, the pleural surfaces and the lungs are free from involvement. This lack of involvement would seem to indicate that the two tumor masses are of separate origin.

Only in the thyroid does one find any evidence of the invasive power of the tumor, the lymph-nodes, although adherent, being discrete and not tending to coalesce. No metastases are present in the liver, spleen, kidneys, heart, lungs or bones.

Although the tumor corresponds anatomically to the usual form of lympho-sarcoma, this correspondence does not extend to the microscopic structure.

We believe that it is best to consider the tumor a primary lymph-node endothelioma, which form of tumor has been described as arising from the reticulum and endothelium of the lymph-spaces. The evidently multiple origin of the tumor is a feature which we wish to emphasize.

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In a search of the literature only one report of a similar case has been found. Gallina,* in 1903, described a tumor involving the cervical, retroperitoneal and mesenteric lymph-nodes, and also both suprarenals. Gross section of parts of the tumor showed hyalin and cystic change, and microscopic examination of all parts involved led to a diagnosis of endothelioma arising from the lypmh-glands and lymph-spaces.

* Virch. Arch. Bd. 172.

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THERAPEUTICS OF VASOCONSTRICTION AND VASODILATATION.*

By Egbert Le Fevre, M. D.,
Visiting Physician, Bellevue Hospital.

The part of the subject that has been assigned to me is so wide, and can be approached from so many standpoints, that I gladly avail myself of the liberty given me by the arranger of the programme to treat it from the standpoint of abnormally high blood-pressure.

From the therapeutic point of view it is necessary to have a clear conception of the condition of the entire vascular system in pathological high and low pressure. The actual degree of blood-pressure depends upon the heart, while the maintenance of that pressure depends upon the peripheral resistance. Normally the vascular system protects itself against sudden changes in pressure by the co-ordination that exists between different parts of the system. As the maintenance of the blood-pressure chiefly concerns us this evening, it will be necessary to consider the conditions which affect this. The following factors have been considered as having a more or less definite influence:

(*a*) The amount of blood contained within the vascular system. The regulatory vascular mechanism is such that wide variations in the amount of circulating fluid can occur without any particular change in pressure.

(*b*) Resistance in the capillaries has been considered a factor of high or low pressure, and Broadbent and others have insisted that the viscosity of the blood has an important bearing; that any increase in viscosity means an increase in resistance to capillary flow. This, however, is not borne out by experiments. In many cases of increased viscosity the blood-pressure is indeed higher, but the explanation given of increased capillary obstruction is not the only one that can be brought forward to explain the high tension. That the blood contains certain substances that act upon the muscle tissue in the arteries and arterioles is the more rea-

* Paper read before the New York Academy of Medicine, March 19, 1908. Reprinted from the Medical Record, April 25, 1908.

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sonable. When the amount of fluid in the body is increased and is contained in the cellular and the perivascular tissues, then the edema may produce a definite obstructive effect upon the capillaries through pressure.

(*c*) Vascular elasticity. The elasticity of the blood-vessels is a more important factor in influencing the velocity of the blood and conserving the energy of the ventricular systole than in effecting arterial tension. The changes in elasticity imply changes in the heart work and the velocity of the blood flow.

(*d*) The tonicity of the muscle tissues in the small arteries and arterioles is the chief factor in maintaining blood-pressure. Therapeutically we should consider the muscle tissue contained in the cardiovascular system as the true parenchyma of that system, and in every case of abnormal blood-pressure with a change in arterial tonicity we should look for the cause of the change.

Conditions that cause hypertonicity in the arterial system may be due to increased irritability of the vasomotor system or of the arterial muscle, both of which conditions may be dependent upon primary toxic or primary nervous influences. The causes of increased irritability may be poisons acting upon the neuro-muscular system of the circulation, which may be extrinsic, as lead, alcohol, tobacco; or endogenous, as bacterial toxins formed in the body; retained excrementory products; certain proteolytic digestive products absorbed from the alimentary canal; increased normal or abnormal secretions influencing metabolism, such as from the thyroid, or acting upon the sympathetic system, as from the adrenals; overwork, which may have a primary regional effect according to the character of the work. Probably the most important and common of these are lead, tobacco, alcohol, overeating, and a mode of life that produces the gouty condition and insufficiency of the kidney.

It is still a matter of dispute how these substances cause high tension. The older conception was that by their presence in the blood they exerted a direct action upon the muscles of the blood-vessels or on the vasomotor and sympathetic nervous system; but later, with a greater knowledge of the influence of internal secretions, both on metabolism and the cardiovascular system, there has been a tendency to put their action farther back and to consider that these substances increase the normal pressor substances in the blood, such as have their origin in the adrenal system, which system includes not only the cells of the medullary

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portion of the adrenals, but the chromophile cells found elsewhere in contact with the sympathetic nervous system, as Zuckerkandl's parasympathetic bodies, the intercarotid gland, Luschka's coccygeal gland, and some collections of cells in the pituitary bodies. The suprarenal glands themselves form only a part of the so-called hypertensive glandular system.

Although the manner of their action cannot be definitely explained, we know positively that these substances produce first an intermittent and later a persistent high arterial tension which causes a definite sequence of events in the entire cardiovascular system.

Regardless of cause, the changes induced by high arterial tension can be divided approximately into three stages. The first stage is characterized by persistent high tension due to hypertonicity of the muscular coats of the arteries and arterioles. This stage has been called that of presclerosis by Huchard, angiosclerosis by v. Basch, chronic arterial hypertension by Cook.

The second stage is that of progressive hypertrophy of the muscular tissue of the cardiovascular system associated with degenerative changes in the intima and fibrosis of the external coat of the arteries.

The third stage is that of diminished muscular control due to progressive fibrosis which causes increased obstruction in the arteries and arterioles of certain areas and a tendency to cardiac exhaustion and insufficiency.

The treatment must take into consideration not only the stage, but also the cause. In the first stage the increased blood-pressure due to the general hypertonicity of the arteries may at first be intermittent, but soon becomes persistent and calls for more cardiac power, which is met by cardiac hypertrophy. The increased ventricular power affects in turn the arterial system, increasing the systolic pressure, and hypertrophy of the muscle tissue in the arteries follows, so that a vicious circle is developed. From the standpoint of treatment it is necessary to recognize the fact that the hypertrophy is not limited to the heart, but extends to the entire arterial system. The so-called idiopathic cardiac hypertrophy belongs to this stage.

The first stage is the curable one and the most important part of the treatment is to find the cause and remove it if possible, or at least bring the blood-vessels under normal physiological vasomotor control. Patients at this stage frequently complain

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of symptoms referable to the circulatory system. These symptoms are very variable, but generally include those of cardiac overaction. On examination nothing very definite is found, except possibly a slight cardiac hypertrophy. If these patients are made to exercise while under examination it will frequently be found that the cardiac rate and force is abnormally increased, and that there is a very decided and persistent rise in blood-pressure, indicating an irritability of the vasomotor control. The development of an irritable and slightly hypertrophied heart in a young person indulging in ordinary athletic sports indicates that the arterial system is abnormally irritable with a tendency to spasm. In examining for the cause of such an irritability it is necessary to take into account all the details of daily life, food, the use of tobacco, exercise, and all those things that are likely to react on the arterial system. Increased vasomotor irritability may be hereditary. When the patient gives a family history of cardio-vascular or renal disease, prophylactic measures are just as important as when there is a hereditary weakness that predisposes to tuberculosis.

Tobacco is especially apt to induce arterial spasm in susceptible persons. All those who have had experience with athletes have noticed this fact. Tobacco interferes with their wind. If examined while under exercise they show a higher arterial tension, and suffer from attacks of dyspnea, palpitation and precordial distress. Many persons who are accustomed to the use of tobacco find that if they change the brand to one that is stronger these symptoms are easily induced. In advanced sclerosis tobacco is sufficient to induce anginal attacks in some persons, while it causes in others acute vertigo so that the patient suddenly falls.

Alcohol also should be absolutely prohibited in all cases showing a tendency to arterial spasm.

The diet should be simple and wholesome, and while it is not necessary for the patient to become a vegetarian, vegetables should form a large portion of the diet and meat should be taken only in sufficient quantities for proper nutrition. The medical treatment of the first stage is largely directed toward increasing the activities of the emunctories. Many writers have called attention to the fact that mercury in its different forms has a marked effect on the arterial tension and that this effect is obtained quite independent of the cathartic action.

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Mental and nervous excitement is an important factor in causing the arterial spasm and hastening the occurrence of the second and third stages. The physiological action of chloral on the vasomotor centre and spinal reflexes explains its action in cases where emotional or mental excitement, or exaggerated reflexes cause arterial spasm. It also has a direct action on the walls of the blood-vessels, as is shown by the dilatation of the cutaneous vessels under its use in persons with normal blood-pressure. It is rarely, at this stage, necessary to act upon the blood-vessels by the use of the more active vasodilators.

In the second stage all the factors that were present during the first stage are much more active in causing disturbances of the cardiovascular system, and there is a progressive obstruction from the arterial capillary fibrosis. As long as cardiac hypertrophy is able to compensate for the obstruction the patient may not be conscious of any change in his general health, except that on exertion cardiac action is increased and he feels the thumping of the heart against the thorax, and later there is a sense of constriction or tightness in the chest.

At this stage it is necessary to determine to what extent the obstruction to the circulation is due to the sclerotic changes in the vessels and how much is due to spasm of the muscular coats. It must be kept in mind that arterial sclerosis does not affect the entire arterial tract uniformly, but that in certain vascular areas the fibrotic changes advance more rapidly. In order to maintain a general high blood-pressure, which is necessary to carry on an efficient circulation in the fibrotic areas, the obstruction in these portions of the vascular area is met by general hypertension, which is made possible, according to Savill, only by muscular hypertrophy in the arterial coats. In the treatment of high tension this fact is lost sight of. High blood-pressure is, in many cases, a conservative process, and the indications are to control it rather than to try to reduce it to the normal level.

The danger lies on the one hand in uncompensated control, and on the other hand in over-compensated control. In the use of vasodilators it must be remembered that their effects are entirely limited to those portions of the arterial tract where the muscle tissue is still capable of exerting control, and that they have absolutely no action upon the obstruction caused by the fibrotic changes in the vessels. "Whatever true structural obstruction may be present cannot be removed; but whatever narrowing

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is due to hypertonus may be removed." The problem presented in each case is to what extent is it possible or safe to act upon the muscle tissue in the arteries.

When the blood-pressure is due to an overaction of the blood-vessels, before giving the general vasodilators it is necessary to determine whether or not the overaction of the muscular tissue is dependent upon some irritation that is acting upon a definite vascular area, and to remove this if possible.

High arterial tension may be due to the abnormal action of some of the normal reflexes. One of the most important of these is the gastro-intestinal reflex. Some change in the arterial tension during digestion is physiological and varies with the individual, the nature of the food, condition of the digestive apparatus and vasomotor system. Normally the taking of food causes a change in the arterial distribution which is sufficient to insure the necessary blood supply to the digestive organs. Dilatation in the splanchnic area is compensated for by constriction in other vascular areas. These circulatory changes may be sufficient to cause the patient to be somewhat drowsy after a meal, or to act upon the peripheral circulation so that the patient feels chilly when exposed to lower temperatures.

Russell has called attention to a vascular reflex having its origin in the digestive organs, and has shown that this reflex is accentuated by the character of the material introduced into the digestive system, and that the continued overaction of this reflex, which acts primarily upon the splanchnic area, produces high arterial tension and hypertrophy and ultimately sclerosis of the muscle tissue in the walls of these vessels. When progressive sclerosis occurs in one vascular area there is associated with it a tendency to hypertonic contraction in the hypertrophied muscle tissue of other portions of the circulation. These facts explain the liability to the occurrence of anginal attacks after a meal, especially breakfast, as the activity of the vasomotor system is much greater in the morning than in the afternoon.

Habitual excess of proteid foods may produce hypersensitiveness of the vasomotor system. When hypersensitiveness is present slight reflexes from abdominal organs can cause sudden arterial spasm. All gastric and intestinal disturbances should be corrected. The diet should be sufficiently nutritive, but not bulky. For this reason strict vegetarian diet is contraindicated. There must be no overloading of the stomach with either solids or liquids.

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The relation of the kidney to high blood-pressure is a very important one, and renal insufficiency caused by excess or error in diet is a frequent cause of presclerosis.

The fact that disease of the kidney is almost invariably associated with high arterial tension has caused kidney lesion to be considered practically the main cause of high tension and secondary arterial sclerosis. Arterial sclerosis is frequently, but not necessarily associated with kidney disease and chronic renal disease has been extended too far as a cause of arterial sclerosis. Its relation to arterial sclerosis may be (1) that the generalized morbid condition in the arteries, characterized by high blood-pressure and various circulatory and nutritive effects, is dependent upon other toxic conditions than those due to the kidney. The vascular change is a general one and the renal vessels take part in it. (2) Primary renal disease may induce cardiovascular changes and arterial thickening.

There is need of separating these two kidney conditions both etiologically, pathologically, and therapeutically. Why primary kidney lesions are so constantly associated with high blood-pressure and changes in the cardiovascular system has generally been explained by the retention of substances that should ordinarily be thrown off by the kidney.

Therapeutically I have always considered that there was another explanation of it namely that in primary kidney disease there was interference or obstruction in the kidney circulation which demanded a higher arterial tension to afford the requisite blood supply for the proper functioning of the kidney. As the circulation of the kidney is part of the splanchnic system, the high pressure needed to maintain a sufficient kidney circulation can only be obtained by changes in the general splanchnic circulation, and as a result the normal splanchnic control over blood-pressure is disturbed. By the use of such diuretics as theobromine, which dilates the renal vessels especially, we may bring more blood to the kidney and so remove the necessity for this general higher pressure. All are agreed that these substances lower excessive arterial tension when they increase the kidney function, but there has been no very definite explanation of how they could influence the splanchnic area.

When high blood tension is associated with kidney disease the degree of blood-pressure as such is considered too exclusively, and the fact is lost sight of that there is need of a higher blood-

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pressure to carry on an efficient circulation in the diseased kidney. It has been very aptly put that "it would be better for a man not to have a sclerotic kidney, but if he has a sclerotic kidney, it is well for him that he has a high blood-pressure." This high blood-pressure, while necessary for the kidney, carries with it dangers elsewhere, and the problem is to keep the pressure at a point which is sufficient for kidney circulation and safe as far as the general vascular system is concerned.

In the later stages of arterial sclerosis when edema occurs, associated as it nearly always is with some change in urinary secretion, the tendency has been to direct our efforts entirely to increasing the urinary flow, although in many cases, with the exception of a slight change in the amount of urine, the evidences of the kidney changes are rather indefinite. I desire especially to warn against the use of immense quantities of water given for its diuretic effect. The circulation in these cases is already overtaxed and there is an excess of fluid in the body. The giving of large quantities of water only adds to the blood mass and increases the work of the heart. There should be marked fluid restriction, free elimination by the bowels and skin so as to bring the fluid content of the body within the power of the heart and the vessels.

Excessive blood-pressure does not itself constitute an absolute indication for treatment and the active vasodilators should be used only to meet emergencies as stenocardia, angina pectoris, and the cerebral disturbances. The vasodilators of the nitrite group, as nitrite of amyl and nitroglycerin, ordinarily have only a temporary effect, and when sustained high pressure is associated with disturbances that cause anxiety, they should be given cautiously and the pulse watched. No sudden or extreme action from these drugs is desirable. They should only be used to meet emergencies.

The effect of the vasomotor dilators is not entirely gauged by the fall of pressure, but by the patient's subjective feelings and the pulse rate. Because these dilators in many cases do not materially lower the blood pressure, many have claimed that they are absolutely useless. In cases of extreme sclerosis, where the obstruction is due to the fibrotic changes rather than the hypertension in the muscles of the arteries, these drugs have a very limited effect upon the blood-pressure; nevertheless, many of the symptoms from which the patient complains are relieved by

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their use. This is due to the readjustment of the circulation, which is made possible by the drugs acting upon the vascular areas where the muscle tissue in the blood-vessels still exerts control. Vasodilators can only reduce blood-pressure permanently when the heart is failing. If under the use of these vasodilators there is a permanent fall of pressure, a quickened pulse rate and no improvement in the patient's well-being, then it is an indication that there is a weak heart and that the high tension necessary to carry on efficient circulation in the important vascular areas is lacking. This is especially true in the last stage of Bright's disease with cardiac dilatation and dropsy. The fact that the case was primarily one of high tension shows that this tension was necessary for the kidney function.

I am thoroughly convinced that the present inordinate use of vasodilators to control arterial tension is not altogether free from danger, and that there is a secondary effect from their use, which shows itself in an increased tendency for the hypertrophied muscle tissues in the vessels to be thrown into spasm under slight reflex irritation. My experience in the treatment of cardiovascular diseases dates back to a time before the vasodilators were used as freely as at present. While patients suffered from anginal attacks then as now, the attacks in the early stages of the disease were not as marked as at the present time. In a certain percentage of cases the use of nitroglycerin causes a temporary rise in arterial tension immediately upon its administration. This is followed by a very great relaxation of the vessels, but when the effect wears off the irritability of the vasomotor control is markedly increased.

Control of high blood-pressure by cardiac sedation is not justifiable except in cases where cardiac hypertrophy is excessive and cardiac overaction occurs under nervous excitement or physical exertion.

We have frequently to decide the question whether altitude is contraindicated in persons with high blood-pressure. Observation shows that the first effect of altitude is to raise arterial tension even in normal persons, but after a few days' residence the pressure falls and later may be lower than before. This has been explained by the effect of the rarified air upon respiration and surface circulation.

As persistent high blood pressure is dependent upon disturbance in the splanchnic area which exerts the normal physiologi-

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cal control over the circulation, one of the most important methods of treatment is the use of those means which influence vascular dilatation in the skin area, as baths, counterirritation, and high frequency currents; and in the muscles, as massage and restricted exercise. One must at the outstart determine how great the disturbance in the splanchnic area is, *i. e.*, to what extent the part it plays in the normal regulatory mechanism is lost. The principle of such treatment consists in causing a dilatation of peripheral vessels, and so a compensation for lost splanchnic control. In a word, it is the educating of the peripheral vessels to control the circulation. Unless these desired effects are obtained, such treatment may be decidedly harmful. This fact is frequently lost sight of and baths, massage, or restricted exercises are advised, without any definite knowledge of the patient's reactive powers, or observation of the patient during and after the use of these remedial measures.

In prescribing baths it must be remembered that the blood-pressure can be either raised or lowered according to the kind of baths used. In high blood-pressure the object desired is dilation of the superficial vessels and slowing of the heart, which is the reverse of that aimed at in low blood-pressure, viz., contraction of the peripheral capillaries and so-called "tonic" effect.

Cold baths of plain water raise the arterial tension. If the patient reacts quickly this rise will be of short duration. In cases with high tension, especially if there is beginning myocardial insufficiency, the reaction does not readily occur. On the other hand, in patients who have always been accustomed to take cold baths, who have educated their peripheral circulation, reaction quickly occurs. It is dangerous to begin with the baths at the temperature ordinarily advised, 90° to 92° F., in patients unaccustomed to cold baths. The temperature should be at 99° to 101° F., and at subsequent baths the temperature may be lowered, but only when the patient reacts quickly and the initial rise is followed by a decided fall in pressure.

In patients who suffer from anginal attacks when exposed to cold air it is very necessary to educate the peripheral circulation by a graded course of baths.

Water that contains saline material, as salt or calcium chloride, or sulphur water, causes a quicker reaction through its effect on the cutaneous vessels, and can be used colder than plain water. The fall of pressure is more marked and lasts longer.

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If to the effect of cold pressure is added in the form of spray or strong needle douches to the entire body, the blood-pressure is raised and persists for some time (tonic effect).

Hot baths reduce the blood-pressure to an extent roughly proportionate to temperature. Hot air or Turkish baths, although raising the pulse rate, reduce the pressure still more than plain hot baths. Moist hot air or Russian baths lower the pressure. The effect of Turkish and Russian baths is modified if cold douche or needle bath is used afterward. The pressure is raised again according to the strength of the douche and the coolness of the water. The alternate hot and cold douche (Scotch douche) raises the blood pressure when the temperature varies rapidly.

The saline baths and effervescing saline baths (Nauheim baths), even when used at a lower temperature than the plain water bath, lower the pressure more and have a cumulative effect, so that after a course of baths the pressure is permanently lowered in suitable cases.

It cannot be too strongly emphasized that the bath treatment, whatever form used, must be adapted to the individual patient, all the details, as temperature, duration, amount of saline, and degree of effervescence, must be determined, and after the bath the condition of the patient should be observed. The good effects of the treatment depend on the ability of the blood-vessels to respond and the control of the vasomotor system over the circulation. When high blood-pressure is due to general fibrosis but little can be accomplished. The same is true when there is marked myocardial weakness.

Massage can raise or lower blood-pressure according to the nature of the movements and whether the abdomen is included or not in the treatment. Effleurage (which includes all stroking movements), tapotement (which includes all percussion movements, as slapping, tapping, beating, clapping, chapping, or hacking), and vibration raise the blood-pressure, while pétrissage (which includes all pressure movements, as kneading, rolling, squeezing of the muscle tissues), after a very slight and short initial rise, reduces blood-pressure if applied only to the extremities and trunk. If the abdomen is included, then there is a rise in pressure.

If a vasotonic effect and increase in blood-pressure is desired, the lighter motions, as stroking, percussion, and vibration of the

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extremities, and kneading, ending with light percussion of the abdomen, is used. If the object is to reduce blood-pressure, the slow, intermittent rolling or kneading of the muscles of the extremities, back, and trunk should be employed, but the abdomen should not be manipulated at all. The treatment should be given in a warm room, so as not to cause contraction of cutaneous vessels.

Passive or resistant exercise gently performed causes a slight initial rise, followed by a fall in blood-pressure during the continuance of the exercise, and a still farther subsequent fall which persists for a varying time. The movements cause a dilation of the blood-vessels in the muscles similar to that produced by massage. If the movements are too energetic or the patient does not breathe quietly during the exercise there is a decided rise in the blood-pressure. Considerable experience is needed to give the exercises properly, and the movements must be adapted to the patient.

The power of the iodides to relieve some of the symptoms caused by high blood-pressure has long been recognized. Balfour, years ago, called attention to the alleviation of pain in aneurysm of the aorta under their use, and showed that it was not due to the effect on the supposed syphilitic change in the artery. The effect was formerly supposed to be due to a lowering of blood-pressure, but since the introduction of the sphygmograph it has been shown that the relief is obtained before there is any reduction, which occurs only in certain cases and after long use. Romberg believes that iodides act by reducing the viscosity of the blood and so lessen the work done by the vascular system. While there is some reduction in the viscosity of the blood, it is not sufficient to account for the effect, and when the viscosity is reduced by other agents even more than it is by the iodide of potassium, there is no amelioration of symptoms or fall of pressure. Recent investigations into the relation of iodine to the functioning of the thyroid gland suggest that it may influence thyroid secretion and so act on the vascular system. This is in line with the action of small doses of thyroid extract on blood-pressure. While thyroid extract does have an effect on high blood-pressure, it is not a medicine that can be entrusted to the patient, as the dose must frequently be changed, and, with any symptoms of hyperthyroidism, stopped. It is much safer to use the iodide of potassium. Rarely more than fifteen grains

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of the iodide of potassium a day in divided doses is needed, and it should be continued in well marked cases for two or three years, with an intermission of ten days to two weeks every two or three months. Usually it is given in too large doses and for too short a time. If combined with sodium bicarbonate, gastric irritation is avoided. It should not produce symptoms of iodism. In the late stage of the cardiovascular or renal disease with edema of the lungs or general edema, it should not be used.

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FRACTURE OF THE SURGICAL NECK OF THE FEMUR, WITH INVERSION OF THE LIMB.

By Joseph D. Bryant, M. D., LL. D.,

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Knowledge is of two kinds. We know a subject ourselves, or we know where we can find information upon it.—Samuel Johnson.

The aptness of this utterance is well illustrated by the fact that we, "ourselves," though for many years circumstanced so as to experience the opportunity, have only lately met with an instance of what we at first regarded to be the above form of injury, and therefore have sought "where we can find information upon it." And it is our special delight to submit this information as an humble contribution to the garland of respect so willingly woven by the medical profession in token of regard for Dr. Nicholas Senn.

On July 22, 1906, I was hastily summoned to consult with Dr. Kadian of New York City, regarding a patient who had sustained a severe injury of the left hip and thigh five days before, from being "squeezed and twisted" between the long side step of a moving street car on which the patient was riding, and a heavily laden vehicle going in the opposite direction, and finally the patient was thrown to the ground, but not run over by either vehicle.

The accident happened so unexpectedly and was attended with such a degree of confusing and rapidly changing conditions that it was wholly impossible for the patient—a lusty, intelligent policeman—to give a sufficiently connected history of the affair, to be of definite utility in expressing satisfactorily the traumatic circumstances relating to the injury. It, however, appeared that immediately following the receipt of the injury the patient was taken by ambulance to a near-by hospital where, while under ether, he was subjected to an extended manipulative examination for the purpose of diagnosis, and, as the result of which, he was told that he had sustained a fracture of the neck of the femur. A little later he was removed from the general to a private hospital, where he came under my observation.

Physical Examination—The left hip and thigh were badly contused at the anterior and outer aspects and were so greatly distended with extravasated blood as to render the integument tense and shiny, obliterating the topographical landmarks of these

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parts. The patient insisted that the increased size and distension of the limb was largely the result of the examination made under ether, and gave a history of the appearance of the limb before and immediately after the examination which could leave but little doubt that the forcible manipulation had contributed not a little to the disturbing appearances which the part presented.

Internal rotation of the limb was pronounced (30 degrees) and quite obstinate. The opposition to external rotation appeared quickly, increased rapidly, and the movement was arrested (not suddenly) at about the angle of 20 degrees. The pain attending this movement (located at the upper and anterior aspect of the thigh), was marked at the beginning of the movement, increasing proportionately with the extent of outward rotation and becoming quite unbearable at the ending of the act. The injured limb was two inches and a half shorter than the other, which shortening, however, could be easily reduced to an inch and a half by means of steady manual traction. As before remarked, the distension of the soft parts about the hip and thigh with blood, together with tenderness on pressure, made impossible the utilization of the relations of the bony points in diagnosis. The injured limb was slightly flexed and could not be restored to the horizontal plane of its fellow without severe pain at the upper and anterior aspect of the thigh and by slight arching of the lumbar spine. These manifestations aroused at once a belief that dislocation of the hip might be present.

Owing to the distended condition of the soft parts of the thigh and hip and because of the increase of the general temperature (102 degrees F.), it was thought best not to interfere for farther diagnostic purposes at this time, but instead to make the patient comfortable pending an interview with the surgeon who had already, as it appeared, made a thorough examination under favorable circumstances a few days before.

Accordingly, a conference was had with the surgeon on the following day, who said that the patient in question on coming under his charge had a much swollen and bruised hip and thigh with considerable pain. The limb was shortened three inches, slightly flexed and decidedly inverted, and after careful examination under ether he came to the conclusion that the patient had sustained a fracture of the anatomical neck of the femur, which was attended with marked inversion. The surgeon also volunteered the statement that the medical men who were present at

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the time of the examination were agreed with him regarding the diagnosis.

As the result of the previous record of the case and the state of the patient it was deemed wise, for the time at least, to apply to the limb a Buck's extension, together with a long side splint, the limb being arranged, with reference to the apparatus, so as to be slightly raised from the bed and rotated firmly outward, and thus held by the means of adhesive plasters, bandages, and sand bags. In this manner the patient rested comfortably. The traction of ten pounds diminished the shortening to an inch, and five degrees more of external rotation attended the change. An increase of five pounds reduced the shortening to five-eighths of an inch and the limb to the same plane as its fellow, with slight, though painless arching of the lumbar spine. It is proper to say at this time that as the extravasated blood in the thigh lessened, external rotation correspondingly increased during the three days which the patient was under my observation, and for this period external rotation was not decidedly arrested, but instead was gradually obstructed, as though slowly wound up by the presence of some generally restraining agent, which was regarded to be the extravasated blood lying throughout the muscular planes of the thigh.

At this time the patient passed from my observation, not again being seen by me until the middle of October.

On my departure from the city the question of fracture of the anatomical neck of the femur with inversion (as decided by the surgeon who had examined the injury under ether a few days before), or dislocation were in mind, the former (because of the examination) seeming to me the more likely.

It was determined that the injury should be at once subjected to the diagnostic scrutiny of X-rays, and that further consultation should be solicited in the event of a consequent need for it.

As I had not seen a case of fracture of the neck of the femur with inversion, it was determined to cause the literature of this form of injury to be searched during the summer, in order to report the information thus gained as soon as possible in the fall. Accordingly, under my direction, my assistant, Dr. Wm. M. Ford, took the matter in hand, with the following results.

The search directed to the published cases was made along the following lines of inquiry: The name of the surgeon; sex of the patient; the location of the seat of the fracture, *i. e.*, whether

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intra- or extracapsular, and the condition of the parts; history of the case; results, died with autopsy; unimproved, cured, result not stated, those cases "discovered" on autopsy, remarks, and the bibliography. The names of the surgeons and the sex of the patient were introduced in order to identify the respective cases and the sources of information relating to them. The location of the seat of the fracture was made a part of the record, so that inferences might be deduced relating to the abnormal anatomical evidences suggestive of the peculiar deformity which attends them, and for the same reason the peculiar state of the capsule of the joints is recorded in the respective fractures; also the relation of the capsule to the seat of the fracture, *i. e.*, intra- or extracapsular. The tabulated history of the cases might also point to a method of injury which would prove enlightening in the estimating the peculiar effect of the injury. The results, especially as related to autopsy, are of significance because of affording the opportunity to study any peculiar arrangement of the injured parts, looking to the cause of deformity. The bibliography is necessarily extended and can be readily reviewed, should one care to make the attempt.

Patient and painstaking search has resulted in the reporting of forty-four cases of fracture of the neck of the femur (see table), with inversion of the limb. Of this number fifteen were intracapsular fractures, eighteen extracapsular, and in eleven the seat of fracture was not stated. In thirty-three a history was given. (The histories of the cases are omitted, for to include them would increase impracticably the length of the paper.) In eleven no history was found. In twenty-six of the forty-four cases autopsies were made, and are a part of the history of these cases. In twenty-one instances autopsy was a part of the immediate history in five, only a part of remote record. In these five of the total number of cases (44) the condition of fracture was described on autopsy, no previous history of these cases being found. Of the remaining eighteen cases, four are said to have been cured (?), and in thirteen the final result is not stated. Of the fifteen intracapsular fractures, eleven autopsies were made; and of the eighteen extracapsular fractures, fifteen autopsies were made—making twenty-six in all. A comparison of the various opinions based on academic reasons and those founded on autopsy findings relating to the causes of inversion of the foot in certain fractures of the neck of the femur, is rather more interesting than instructive.

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Some Reasons for Inversion.

The reasons of various surgeons regarding the cause of inversion of the foot in fracture of the neck of the femur. The numbers attending the names refer to the main chart and bibliography immediately following. The reasons are divided into academic and those based on observation and autopsy.

Academic Reasons.

Brewer (1): Inversion may be present at first, due to the direction of the fracturing force. Says that it is rare.

Bryant (2): Inversion is "due to the direction of the fracture of the bone and of the fracturing force."

Ross & Carless (3): State that it is probably due to violence directed from behind forward, and to impaction of fragments. Regard the condition as being rare.

Albert (4): Due to anomalous fracture of bone.

Dupuytren (5): Attributes the inversion to the relative position of the fragments.

Brun (6): Suggests that simple fracture above or below the lesser trochanter or a simultaneous fracture of the neck and "introchanteric" region may cause inversion.

Goyraud (7): Believes that the lower fractured surface slips behind the head of the bone, thus throwing the great trochanter forward; thus the neck is clamped between the capsule and the head of the bone and is fixed in place by the gluteus medius.

Lonsdale (8) & Moullin (9): Believe inversion is due to locking of the fragments "within one another" by the force that produces the fracture. Lonsdale adds: "Another cause not unlikely" is for the upper end of the shaft to be driven through the capsular ligament, in such a manner that it can not be turned outward until extension is made. This form of injury is rare.

Erichsen (10): Believes inversion is caused (at least in some cases) by temporary paralysis of the external rotators.

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1. Text-Book of Surgery, 1903. Brewer.
2. Practice of Surgery, 1884. Thomas Bryant.
3. Manual of Surgery, 1905. Ross and Carless.
4. Lehrbuch der speciellen Chirurgie, 1898. Albert.
5. Principles and Practice of Surgery, 1853. Pirrie.
6. Clin. Chirurgie, 1884, vol. 1. Nelaton.
7. Lehrbuch der Chirurgie, 1874, 7th ed., vol. ii. Bardeleben.
8. A Practical Treatise on Fractures, 1838 (London). Edw. F. Lonsdale.
9. Mansell Moullin, 1895, 3d ed.
10. { Science and Art of Surgery, 1860. Erichsen.
    { Principles and Practice of Surgery, 1878. Ashhurst.

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Reasons Based on Observation and Autopsy

Direction of Force

Greig (11) & Smith (12): Inversion is due to the displacement of the lower fragment in front of upper.

Powers (13): Says, "It would appear that the direction of the force which produced the fracture was that most likely to impel the external fragment in the anterior direction—the very position which it occupied with regard to the superior or internal fragment,—and thus determine the inverted position of the limb.

Periosteal Bands

Ozenne (14): Says, "The persisting band of periosteum at the lower border of the neck and the peculiar character of the break were doubtless responsible for the inversion."

Pirrie (15): Says, "I believe that the integrity and tension of the iliofemoral ligament was the cause of the adduction, flexion and inversion of the limb." Occurs occasionally.

Interposition of Bone

Linhart (16): Believes that the commonest cause of inward rotation is the interposition of one fragment of bone between two others, as seen in his case.

Muscular Action

Fayrer (17): Thinks that in his case inversion was mainly due to muscular action.

Guthrie (18): Considers it probable that the inversion arises from a diagonal fracture through the trochanter major, so that the gluteus medius and minimus with the tensor vaginæ femoris draw the thigh bone forward and rotate it inwards.

Burns (19): Inversion "is readily explained by the bruising and resulting incapacity of the external rotators. But inversion may occur in intracapsular fracture when the same explanation may hold good, although a number of others have been offered."

NOTE

Bevan (20) & Malgaigne (21): Each offer extensive explanations which were not included in the foregoing.

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11. Edinb. Med. J., vol. xl., Part II., 1895. David M. Greig.
12. A Treatise on Fractures in the Vicinity of the Joints and on Certain Forms of Dislocations, 1854 (Dublin). Robert William Smith.
13. Dublin Medical Press, 1861. J. H. Powers, F. R. C. S.
14. Le Prog. Méd., 1877, V. Ozenne.
15. The Lancet, 1879, vol. i. (London). William Pirrie.
16. Oesterr. med. Wochenschr., 1845, No. 18. Linhart.
17. Clinical and Pathological Observations in India, 1873. J. Fayrer, C. S. I., M.D., F.R.S.E.
18. { A Treatise on Fractures, 1844. Astley Cooper.
    { A Treatise on Fractures, 1859. Joseph François Malgaigne.
19. Principles of Surgery, vol. i., 1838. John Burns.
20. Dublin Q. J. M. Soc., vo. x., August and November, 1850. Article xi., Philip Bevan.
21. A Treatise on Fractures, 1859 (Philadelphia). Joseph François Malgaigne.

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The infrequency of this variety of manifestation of injury is emphasized by the fact that Agnew, Boyer, Cloquet, Louis, Nelaton, Sabatier and many others of extended observation never had had their attention directed to a case of this kind. According to Ashurst, it "has been observed," to Bardeleben, it "occurs with great rarity;" and to Sir Astley Cooper, it is "extremely rare." In sixty cases of fracture of the neck of the femur, Cloquet did not see inversion of the limb. Linhart, Pirrie, Tillmanns and Wyeth regard it as being very infrequent. Benjamin Bell, B. Cooper, Wharton and Curtis do not mention the presence of such deformity in fracture of the neck of the femur.

In conversing, at different times, regarding this variety of deformity, with surgical colleagues of extended experience, many have disclaimed having seen a case, others are uncertain, and a very few regard it as being not uncommon. I have a notion that this deformity in fracture of the neck of the femur is so rare as not to have attracted attention, except, perhaps, in such a disjointed way as not to invite continuous thought concerning the matter.

It is not needful that the author shall assign reasons for the deformity which in his case prompted the searching of the literature relating thereto, since but casual reading of the following outcome of the case will alone account for the inversion without the exercise of a present imagination or the utilization of a past experience.

> 'Tis but to know how little can be known,
> To see all others' faults and feel our own.
>
> ALEXANDER POPE.

On returning from the country about the first of October, at once Dr. Kadian was communicated with regarding the case in question. It appeared that soon after my departure, early in the summer, the patient sustained an acute and somewhat protracted attack of lobar pneumonia, which made it impossible for the employment of special means in diagnosis, and also that the time was nearly all consumed in attention to the immediate demands of the patient, irrespective of the injury itself. At once, however, the patient was placed in the hands of Dr. Cauldwell, a well-known expert in X-ray matters. He reported that the patient had dislocation of the head of the femur on the dorsum ilii, complicated with fracture of the brim of the acetabulum. That the femur was dislocated, an examination of the patient at this time readily

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disclosed. It was not quite certain, however, that I could find on the negative any evidence of fracture of the brim of the acetabulum, as was confidently expressed by Dr. Cauldwell. The presence of bony crepitus so certainly experienced by the surgeon who first examined the patient, aided by the effect of anesthesia, served to emphasize the probability of the correctness of Dr. Cauldwell's opinion regarding fracture of the brim of the acetabulum. It is proper to say at this time that Mr. Mason, the distinguished photographer of Bellevue Hospital, confirmed the opinion of Dr. Cauldwell after a careful examination of a negative made by himself while the patient was in the hospital. Believing that the presence of this fracture might account largely for the ability to reduce the shortening of the limb to less than three-quarters of an inch at the time of first meeting with the patient, and also account for the bony crepitus discovered by the examination made in the first instance, and possibly opportunity in reducing the dislocation, it was determined at once to make the trial at the earliest time. Accordingly the patient was anesthetized, and earnest and continued efforts were made to overcome the dislocation, but without effect. In a final trial, however, attended with increased effort, the neck of the bone was fractured. This accident, however, was not regarded as a special misfortune, since it permitted of a much better adjustment of the limb, which could then be reduced to within an inch in length of the normal limb and with the alignment of the foot and thigh in proper relation to the opposite one. The patient remained in the hospital in bed under common treatment for fracture, without special pain, the usual length of time and was discharged with an inch shortening, and otherwise was not unusually afflicted by reason of the displaced head of the bone.

Veritatis simplex oratio est.—SENECA.

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BIBLIOGRAPHY OF FORTY-FOUR CASES OF FRACTURE OF NECK OF FEMUR WITH INVERSION, NUMERICALLY ARRANGED.

CASE 1. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 2. Observations of the treatment of fracture of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.
A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 3. Observations on the treatment of fractures of the upper third of the thigh bone, 1828 (London). Joseph Amesbury.

CASE 4. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.
A practical treatise on fractures, VIII edition, 1891 (Philadelphia). Frank Hastings Hamilton.
Med. Chir. Trans., vol. xiii, 1827 (London). George Langstaff.

CASE 5. A treatise on fractures, 1844 (Philadelphia). Astley Cooper.

CASE 6. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 7. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 8. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.
Columbus (Ohio) Med. J., Nov., 1882. W. J. Conklin.

CASE 9. A practical treatise on fractures and dislocations, VIII edition, 1891 (Philadelphia). F. Hastings Hamilton.

CASE 10. A practical treatise on fractures, 1838 (London). Edw. F. Lonsdale.

CASE 11.
CASE 12.
CASE 13. } A treatise on fractures, 1859 (Philadelphia). Joseph François Malgaigne.

CASE 14.
CASE 15.
CASE 16.
CASE 17.
CASE 18.
CASE 19.
CASE 20. } A treatise on fractures in the vicinity of the joints and on certain forms of dislocations, 1854 (Dublin). Robert William Smith.

CASE 21.
CASE 22. } A treatise on fractures, luxations and other affections of the bones, III edition, 1817 (Philadelphia). Pierre Joseph Desault.

CASE 23. Pac. Med. & Surg. J., vol. iv, June, 1870-May, 1871. A. S. Hudson.

CASE 24. Edinb. Med. & Surg. J., vol. xlvi, 1836. George Gulliver.

CASE 25. Dub. Q. J. M. Sc., vol. x, 1850. Philip Bevan.

CASE 26. Clinical and Pathological Observations in India, 1873. J. Fayrer, C.S.I., M.D., F.R.S.E.

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CASE 27. } Edinb. Med. J., vol. xl, Part II, 1895. David M. Grieg.
CASE 28. }

CASE 29. The Med. Age, vol. i (Det., Mich.). J. A. Wessinger.

CASE 30. } Science and Art of Surgery, 1873 (Philadelphia). John E.
CASE 31. } Erichsen.

CASE 32. } Lancet (Lond.), 1879, vol. i. William Pirrie.
CASE 33. }

CASE 34. Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
A practical treatise on fractures, 1838 (London). Edward F. Lonsdale.

CASE 35. } Lond. Med. & Surg. J., vol. i, 1832. Baron Dupuytren.
CASE 36. } Clin. Chir., vol. i, 1839. Dupuytren.

CASE 37. A treatise on diseases of the bones, 1726 (London). John Louis Petit.

CASE 38. Vrtljschr. f. gerichtl. Med., 1904, xxvii. Feldman.

CASE 39. Progrès Méd., Par., 1877, V. Ozenne.

CASE 40. Dub. Med. Pr., 1861. J. H. Powers.

CASE 41. Oesterr. Med. Wochenschr., 1845, No. 18. Linhart.

CASE 42. Principles of Surgery, vol. i, 1838. John Burns (case).

CASE 43. } Ber. d. k. k. Krankenh. Wieden für 1874, Vienna, 1875. Mose-
CASE 44. } tig von Moorhof.

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THIS ACCOMPA[NIED] TERISTICS RELATING TO FORTY-FOUR INSTANCES OF INVERSION PERIODS.

Number of Case	Surgeon	[ES] OF FRACTURE [THE] CAPSULE	FRACTURE	REMARKS BEARING ON EARLY APPEARANCES OF THE INJURED PART
1.	STANLEY	[and] iliacus) broken off. 2. Fracture		Swelling and contusion. Limbs not of equal length by traction.
2.	GUTHRIE	[ma]jor diagonal to trochanter minor.		
3.	SYME	[s] obliquely downward and inward. [j]unction of shaft.		
4.	LANGSTAFF	[h]anters."		Muscles rigid.
5.	COOPER			
6.	CRUVEIHIER	[g] walls, into which interval was re-		
7.	BIGLOW			
8.	W. J. CONKLIN	[t]erior and posterior intertrochanteri[c] [t]o cancellated structure of the shaft		Shortening not overcome by gentle traction
9.	HAMILTON			
10.	LONESDALE			
11.	MALGAIGNE			
12.	M. MERCIER			
13.	M. MICHON			
14.	SMITH			
15.	SMITH	of cervix and shaft. [a]ch broken off.		
16.	SMITH	[s]ely at its base. Portion of bone [ri]c space together with lesser tro- [a]mminuted and displaced.		
17.	SMITH	[b]ase. 2. Trochanter major broken [a]nter minor broken obliquely from		Considerable swelling
18.	SMITH	[a]cellated tissue of trochanter. [t]rochanter and posterior ½ of great		Admitted of slight eversion
19.	SMITH AND FLEMING			Eversion caused pain. Inverted limb not shorter, the other fractured 20 years before.
20.	SMITH	[a]l to capsule, it had been driven into [e]r fragment breaking off the entire [a]ce of femur turned inwards.		Effort to walk increased shortening and caused inversion.
21.	DESAULT			Rotary motion of trochanter on its axis
22.	DESAULT			
23.	HUDSON			Chloroform. Limb straightened Crepitus, free motion, tendency to eversion.
24.	GULLIVER	[t]h shaft detaching posterior part of [t]h minor with the upper fragment		
25.	BEVAN			Pressure on heel increased shortening 1 in. and inversion Rotation outward to normal.
26.	FAYRER			As patient's health failed foot became inverted.
27.	GRIEG (TEMPELMAN)	upper. Fracture along anterior in- [a] large fragment had been detached. [a]fter trochanter; some comminution		
28.	GRIEG			Shortening not overcome by extension.
29.	WESSINGER			
30.	ERICHSEN			
31.	ERICHSEN			External rotation caused great pain. Plaster applied. Result No inversion No eversion. No shortening.
32.	PIRRIE (RODGERS)			
33.	PIRRIE			
34.	PARÉ			
35.	DUPUYTREN			
36.	DUPUYTREN			Great troch. 4 fingers' higher than it ought to be. Ext. rotation no resistance.
37.	PETIT	[o]ward and backward after fracture [p]erfectly.		
38.	FEALDMAN (BENNETT)			Could raise heel from bed. Motion aggravates pain in hip. Abduction and adduction possible.
39.	OZENNE	[a]re both completely detached from [o]bliquely downwards and outwards. [e]ing all pieces		Slight movement caused great pain. After a few days limb became everted with increased shortening.
40.	POWERS	[i]n into 3 fragments. 1. External [p]osterior aspect of trochanter major [m]ost of the epiphysis and trochanter [a]terior fragment of trochanter major.		"Limb could not be rotated outward, only as far as straight position"
41.	LINHART	2. Posterior part of trochanter [a]t trochanter). 3. Trochanter minor [c]d forwards.		
42.	JOHN BURNS			Slight passive motility
43.	MOSETIG VON MOORHOFF			
44.	MOSETIG VON MOORHOFF			
	Totals.....			
	Grand Total.			

+ Shorten

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OBSERVATIONS ON THE TREATMENT OF FRACTURE OF THE NECK OF THE FEMUR IN ONE HUNDRED AND TWELVE CASES.*

By John B. Walker, M. D.

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Since January 1, 1906, there have been admitted to Bellevue Hospital 378 cases of fracture of the femur, and of these, 112 were cases of fracture of the neck.

Fifty-three cases occurred in males and fifty-nine in females; forty-nine involved the right femur, and fifty-eight the left femur.

Nine cases occurred in patients under 30 years of age; twenty-one cases between 30 and 50; twenty-two cases between 50 and 60; forty-two cases between 60 and 70; fifteen cases over 70. In three cases the age was not given.

These fractures were formerly regarded as occurring almost exclusively in old age. Kocher stated that he had observed it rarely before the age of 50. Our statistics show a large number occurring below this age. This is probably due to the fact that accident cases are now more frequently brought to hospitals for examination. That its frequency increases with age is due to senile changes—senile osteo-porosis, which is caused by the diseases of the vascular walls. The cortex becomes thinner and many of the lamellae of the spongiosa are absorbed, being replaced by large cavities filled with yellow marrow. All the conditions, which formerly gave the femoral neck its power and resistance are lost. Especially in women is this change marked, so this fracture occurs a little more frequently in women than in men, as above fifty-nine cases in females and fifty-three cases in males.

Cause—In fifty-one cases the cause was due to slipping and falling upon the floor or sidewalk, frequently due to a misstep. These cases were generally more than 60 years of age. In twenty-eight cases the accident was due to falling from a ladder,

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scaffold or down stairs; in this class the force of the fall was greater than in the first group.

In eighteen cases the accident was due to a fall from a still greater height; as from a loft, down an elevator shaft, or from a fire escape, etc. These cases were all under 50 years of age.

Thus the most frequent cause was mild in character, and occurred chiefly in the old, while in the younger individuals greater violence was the rule. In many cases the histories stated that the patient fell directly upon the hip and that a contusion was found in this region, so that here direct violence was the cause. In several other histories we find "that as he stumbled he tried to straighten up to prevent falling, but he suffered severe pain in the hip and fell." This indirect cause is due to the hyperextension of the hip joint thus tightening the ilio-femoral ligament, and the latter by reason of its greater strength tears the neck away from its base, the trochanter.

Symptoms—Pain was present in every case, and was always increased by motion.

Loss of function was noted in ninety-four cases; in but few cases could the heel be partly drawn upward toward the hip.

Anatomy—In consulting the records of the above cases, which were dictated at various times by different surgeons, a considerable variation of nomenclature was found. Some adhered to the old terms of intra-capsular and extra-capsular, others included both varieties of fractures under the single term of "Fracture of Neck;" still others used Kocher's classification of fractura subcapitalis and fractura intertrochanterica.

The terms intracapsular and extracapsular are unscientific, inaccurate and misleading because the majority of cases do not fall distinctly into either group since they are "*mixed.*" Intracapsular cases were supposed to include all those in which the lines of fracture were entirely within the capsule; extracapsular, all those which were entirely without the capsule. The majority of fracture lines are oblique or diagonal and not strictly transverse, consequently a fracture may be intracapsular in front and extracapsular behind, inasmuch as the capsule is so placed that it includes more of the joint in front and below than above and behind.

Kocher's terms, while more strictly anatomical, have not gained popular usage.

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Stimson's classification has been followed, *i. e.*, fracture through the neck or subcapital, and fractures at the base of the neck. The neck is apt to break in one of two places, at its junction with the head, or at the base, at its attachment to the trochanter.

Formerly it was considered of more importance to differentiate closely between these two fractures; if the fracture were intracapsular the prognosis was far more unfavorable than in extracapsular fractures, consequently less was to be expected and the treatment might be less efficient.

Outward rotation was noted in eighty cases. If a line be drawn through the axis of the limb passing through the interior superior spine and the tip of the great toe, the part of the limb lying to the outer side of this axis will be much heavier than the inner part. If now the normal support of the limb, the femoral neck be broken, the limb will naturally rotate outward by its own weight. When impaction occurs it will also be rotated outward, for the impaction takes place usually at the posterior part of the neck and the trochanter is twisted backward.

Shortening was recorded in seventy cases: In three cases ¼ inch existed; ten cases ½ inch existed; twenty-two cases ¾ inch existed; twenty cases one inch existed; fifteen cases 1¼-2 inch existed.

Shortening is the most important symptom and depends upon the lessening of the angle between the neck and the shaft, which approaches more to a right angle, upon impaction of the fragments or their displacement longitudinally. After the fracture occurs the strong muscles which are inserted about the trochanter contract and draw the trochanter upward, inward and backward toward the crest of the ilium, until checked by the resistance of the untorn part of the capsule or by the abutment of the lesser trochanter against the inner fragment.

If impaction occurs the lower portion of the neck may be forced into the spongiosa of the head; under these conditions shortening is not more than one inch. If the impaction is separated and the capsule yields, the shortening may become increased to several inches. This was observed in several cases where movements had been made, and the weight of the body had been borne upon the fracture.

Exact measurement is frequently difficult because it is so hard to keep both legs at the same angle with the pelvis; they

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should be parallel or equally abducted from the median line. The measurement should be taken from the anterior superior spine to the most prominent point on the internal malleolus.

Bryant's method was frequently used. It consists in dropping a perpendicular from the anterior superior spine and measuring the distance from this line to the top of the trochanter and then comparing this with the other side.

A number of records merely stated that the trochanter was above Nelaton's line—a line drawn from the anterior superior spine to the tuberosities of the ischium.

Crepitus was recorded in forty cases, and was elicited during the gentle rotation of the leg with slight flexion.

False motion was occasionally mentioned.

Impaction was seldom recorded—in but six cases; when one reads the histories of the class of patients who enter Bellevue, and considers the period of delay which frequently exists before treatment is begun, it is not surprising that impaction seldom persists. That it was present at some time to some degree can be recognized from the x-ray plates. These were made in thirty-six cases. In twenty-nine cases the fracture was at the base and impaction existed in eighteen cases; in six cases the fracture was through the neck and impaction existed in one case.

Fullness in Scarpa's Triangle—Under normal conditions the finger tips can be pressed deeply into the outer part of Scarpa's triangle, but in those cases in which there has occurred a fracture of the femoral neck a marked bony resistance is perceived on pressure. This is due to the fact that in the most common variety of fracture the head and neck are bent backward and downward, thus resulting in forcing the apex of the angle of fracture upward and forward into the region beneath Scarpa's triangle. In a number of cases this has been a well marked symptom, but in few cases has it been recorded.

As indicating the necessity for a more thorough early examination with the additional help of an x-ray plate, it may be remarked that there were fifteen cases of fracture, which had been treated from five to ten days before entering Bellevue, as bruises, sprains and rheumatism. Later careful examination demonstrated a fracture in each case.

Mortality—Ten patients died in Bellevue within the first week after admission, five of cardiac disease and five of pulmonary disease. The youngest who died in Bellevue was 58 years of age, and only

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two died under 60 years of age. Both were women. Seven patients who were transferred to the Island, died—four within two weeks, three within six weeks. Of the eighteen who died within six months after the injury, two were between 50 and 60 years of age, ten were between 60 and 70, six were over 70.

Results—Of the 112 cases, eighteen died; thirty-two have not been found, on account of the migratory life of this class; thirty are unable to work because of persistent pain, restriction of movement at the hip or on account of shortening and abduction, which made it necessary for the patient to use crutches; twenty-two show improvement; twelve have abandoned their crutches and are walking comfortably with a cane, although there is some stiffness and occasional pain. They are beginning to do some work. Ten have recovered almost completely; they are free from pain and stiffness, and are able to do their usual work. Ten are still in the hospital.

In searching through the histories and records of these cases it was interesting to learn that thirty-four cases or 30 per cent. had been brought to Bellevue from other hospitals where they had remained for less than one week. Furthermore, of all the cases admitted to Bellevue, fifty-four cases or 50 per cent. were retransferred or discharged from Bellevue within fifteen days.

Considering that so many patients were accorded so brief and doubtless unsatisfactory treatment before being discharged or passed on to some other hospital, one might feel that there was some slight indifference to the future welfare of a patient suffering from fracture of the neck of the femur. One acute observer has written that "it may well be that treatment is perfunctory because the prognosis is bad and the prognosis is bad because the treatment is ineffective." There exists the general belief that definite treatment toward securing restoration of form and function is hazardous and of little avail. Authorities have stated that "our prognoses in cases of fracture of the neck must always be unfavorable," and also "if he escapes with his life he has to be contented with loss of function, loss of symmetry and equipoise, and he is often obliged to go about permanently crippled."

Scudder gives the following results:

Results after Fracture of the Hip—"Of especial value in this connection are the conditions existing in sixteen cases of fracture of the hip, many years after the accident. These sixteen cases

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were treated at the Massachusetts General Hospital by traction and immobilization for periods varying from a few weeks to a few months. The patients then went about with crutches. No other treatment was used. Nearly all the cases were unimpacted either primarily or secondarily. At the time of the accident, seven cases were between 42 and 47 years old, the remainder—with two exceptions, whose ages are not stated—were over 50; three were over 60 years old. These cases reported for examination from two and one-half to twenty-four and one-half years after the accident. Thirteen of the sixteen cases have impairment of the functional usefulness of the leg; a weakness of the limb, necessitating a crutch in many instances; all movements at the hip somewhat restricted; atrophy of the muscles of the thigh, buttock, and calf of the leg; a decided limp, requiring a cane; pain in the hip extending down the thigh even to the sole of the foot; pain at night in the hip; pain in going upstairs and in stooping over. In only two cases out of the sixteen could it be said that the leg was functionally useful."

These results are most unsatisfactory, and in combination with the above similarly unfavorable results in Bellevue they explain somewhat the generally pessimistic views of the profession at large.

In his latest volume an eminent authority writes: "The attainment of the ideal object of treatment—restoration of form and function is rarely to be expected or *even sought.*"

These unfavorable clinical results, together with the opinions of the authorities quoted, emphasize the words of Bardenheuer at the last German Surgical Congress, when he stated that the suitable treatment of fracture of the neck of the femur was the most difficult in the entire realm of fractures and also the one most unsatisfactorily treated.

Bardenheuer and Maxwell both have demonstrated that it was possible under their methods of combined lateral and longitudinal traction, to obtain better results than under the usual methods with side splint and longitudinal traction.

Appreciating the impossibility of obtaining success with the old time method and being unable to employ in Bellevue the apparatus of Bardenheuer I have used in sixteen cases during the past eighteen months the method advocated by Whitman.

Of these cases five were males and eleven were females, nine cases were under 50 years of age; three were between 50 and

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60; four were over 60. One was through the neck not impacted; twelve were at the base; seven were impacted. In thirteen x-ray plates were made to corroborate the diagnosis.

Method—The following procedure was employed in the above cases. A careful examination was made of the patient's condition in order to determine the wisdom of giving an anaesthetic for a period of twenty minutes, this time being required for the application of the plaster bandage.

As soon as the anaesthetic permitted complete relaxation a gentle examination was made of the fracture, and frequently crepitus was found in those patients in whom impaction was thought to be present.

The patient was then lifted up from the table and placed upon a box or pillows about eight inches high and large enough to support the head, shoulders and trunk. The pelvis rested upon a sacral support and the extended legs were held by assistants, one assistant holding each leg. Another assistant stood at the head to hold the patient by the shoulders and trunk when later extension became needed. The fractured leg was then *gradually* abducted to the normal limit of about 45 degrees, the hip joint being held and supported by the hands of the operator. At the same time traction was being made to overcome the shortening by drawing down the leg as far as possible toward its original length as shown by previous measurements. The pelvis was prevented from tilting upward by simultaneously abducting the sound leg to 45 degrees, this serving to indicate approximately the angle at which the fractured leg should be fixed. Outward rotation was corrected at the same time by lifting up and supporting the upper end of the femur and rotating inward the leg.

The plaster spica was applied extending from the toes to the costal margin; this permitted the patients to move about semi-reclining and to rise in bed without the discomfort which usually followed when the bandage was carried up to the chest line. It was fitted closely about the pelvis, particularly about the trochanter and behind the articulation so as to give unyielding support to the fracture. Further, the bandage was closely molded about the patella and condyles of the femur and included the foot, thus preventing completely any outward rotation.

In order to render the plaster bandages as comfortable as possible, folded cotton batting or sheet wadding was placed over all bony prominences, and over this was put a flannel bandage,

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carefully adjusted, free from wrinkles or creases, avoiding all direct pressure over bony prominences. The plaster edges were trimmed and rounded so as not to come into contact with the skin.

Difficulties—It is difficult to apply the plaster bandage because it is necessary to have experienced assistants with sufficient strength to overcome the contractions of the strong muscles during the entire period required to apply the bandage, and it requires unusual steadiness and concentration of attention on the part of the operator, and *each* of the three assistants to maintain the exact relation of the fragments, for unless the bandage be applied accurately, it will be either inefficient to correct the displacement or uncomfortable for the patient.

In hospitals where there are many such fractures it would be advisable to have a table similar to that employed by Schede, upon which the patient can be satisfactorily held.

It was hard to make the proper abduction and at the same time to prevent shortening. It is very important to make abduction complete as it exercises direct traction upon the capsule and it renders the capsule tense in front and below. As it supports the sides of the fragments it tends to force them into alignment, so it assists in correcting the malposition of the inner fragment and brings the two into contact.

In impacted fractures, passive abduction affords the most practical method of reducing the deformity without danger of widely separating the fragments.

In many of the unimproved patients it was found that their inability to walk without discomfort was due to a restriction of abduction. Adduction was marked and added an apparent to an actual shortening of the limb. It is very important to overcome the shortening which is present in the majority of patients for this shortening is responsible for most of their later disability.

Advantages—The plaster bandage maintains complete immobilization during the period of repair, overcoming the shortening and adduction. The abduction prolonged during four weeks is of marked importance in aiding the future ability to walk without impairment or limitation of motion. It further relieves the patient from much unnecessary suffering on movement, and renders him far more comfortable.

Treatment—The aim of the treatment should be the restoration of the normal function of the hip joint, and in order to accomplish this result the normal anatomical form must first be re-

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stored. The same principles which are necessary to produce success in the treatment of fractures in other situations must also be employed here. In another group of cases, which is fortunately small, the age and weakness of the patient are so marked that only expectant or palliative treatment should be considered. It is not difficult for the surgeon to decide upon the conservative method in these cases. It is desired to suggest the plaster bandage method for the larger number of younger and more robust patients for whom our results would indicate it to be desirable and applicable.

As the chief object is to endeavor to obtain the complete or approximate restitution of the normal anatomical figuration of the bone, so it becomes necessary to overcome the displacements of the fragments. The proximal fragment being beyond our control we must endeavor to bring the peripheral fragment—the peripheral part of the femoral neck into alignment with the prolonged axis of the central fragment. The upper end of the distal fragment, the trochanter major is drawn upward by the action of the gluteals and rectus femoris in front; by the biceps, semitendinosus and semimembranosus behind; it thus becomes deviated upward, inward and backward (producing the shortening; the outward rotation is due to the mechanical weight of the leg, a result of gravity), hence it must be conducted forward, downward and outward. To accomplish this, two forces are necessary, longitudinal and lateral traction. These have been used by Maxwell and Bardenheuer, and especially developed by Bardenheuer.

As has been shown, the larger number of fractures occur at the base of the neck and in most of these cases impaction is also present, immediately after the injury. In many cases, however, this impaction is broken up and the fragments are separated when the patient is brought to the hospital—especially Bellevue. In unimpacted cases, there has been no difference of opinion regarding the attempt to replace the fragments in their normal anatomical position. But in those cases in which impaction remains there is a decided variance of opinion. It seems best after observing the good results obtained by Bardenheuer, Ochsner, Maxwell, Whitman and others to recommend that the deformity be reduced (while the patient is under the anaesthetic), by *carefully* separating, and *unlocking*, the fragments *not by tearing* them asunder violently and harshly, but by carefully opening them as one would open a hinge.

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Treatment should begin at once after the injury, before the muscles have time to contract, and so displace the fragments. Each day's delay renders the reposition and reduction of the deformity so much the more difficult, and also permits the fragments to rub against each other, causing an increasing irritation which results in the production of an hypertrophic callus. Exact early reposition of the fragments decreases the amount of callus, and is indispensable for union in unimpacted fractures.

"At the present day our endeavor is not the production of so much callus, but rather as little callus as possible. When the fractured surfaces are in exact contact with each other along the entire extent nature does not need to supply much callus. Severe swelling about the fracture is always the expression of malposition of the fragments."

In Germany various surgeons, who have employed the extension method of Bardenheuer with such excellent results, recommend it so highly that it should be used here when circumstances permit. It will require experienced assistants who must be interested in its successful outcome.

Results.

Case 1.—Male 45, moderately stout, alcoholic. Four days before admission he fell upon the left hip and was unable to move. He was brought to Bellevue, where a diagnosis of fracture at the base of femoral neck was made. There was ¾-inch shortening, and outward rotation existed. He was given an anæsthetic, and crepitus was then easily found. A plaster bandage including the foot was applied. At the end of four weeks he was allowed out of bed on crutches; at the end of six weeks the plaster bandage was removed below the knee; at the end of eight weeks the entire bandage was removed and he went about on crutches, without any pain; at the end of three months he was doing well, still using crutches; at the end of four months he had abandoned crutches and was using only a cane; at the end of six months he was at work; at the end of twelve months he had but ¼-inch shortening, and was able to do his regular work as a mechanic. Sixteen months after the accident he is without pain or discomfort and has but ¼-inch shortening; flexion and abduction are practically normal.

Case 2.—Male 65, large frame, well nourished. Four days before admission he slipped and fell upon the sidewalk, striking his right hip. He was unable to move and was treated for a bruise for three days. He was transferred to Bellevue, where a diagnosis of fracture at the base of femoral neck was made; there existed marked outward rotation and 1¼-inch shortening. Crepitus was present and fullness in Scarpa's triangle. Under an anæsthetic a plaster bandage was applied. He was confined to bed for four weeks, then allowed to use crutches daily. At

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the end of eight weeks the entire bandage was removed, but he was not permitted to bear any weight upon the injured hip until the fourth month; at the end of six months he used a cane only at times and was able to do work as a janitor; at the end of nine months he was in good condition, he could walk well without pain, go up and down stairs, and there was less than ½-inch shortening; flexion and abduction are normal.

CASE 3.—Female 47, large and fleshy. Two days before admission slipped and fell upon the sidewalk, striking upon the right hip. She was unable to move and could not stand when lifted up. On entering Bellevue a diagnosis of fracture at the base of femoral neck was made. There were present outward rotation, fulness in Scarpa's triangle, crepitus, and ½-inch shortening. Under an anæsthetic a plaster spica bandage was applied. At the end of five weeks the bandage was removed below the knee; at the end of eight weeks it was entirely removed and she was about on crutches; during the sixth month she used only a cane; at the ninth month she was able to do her normal housework without discomfort. She has no perceptible shortening; flexion and abduction are normal.

CASE 4.—Male 17. Two days before admission he fell down an elevator shaft, a distance of about five stories. He was unconscious, but recovered within the next twenty-four hours. There was found to be a fracture at the base of femoral neck. Outward rotation and 1¼-inch shortening were present. Under an anæsthetic a plaster spica bandage was applied. At the end of three weeks the bandage was removed below the knee; at the end of four weeks he was out of bed using crutches; at the end of eight weeks he was using a cane; at the end of four months he was working on a farm; at the end of six months he was doing his regular work as a mechanic; at the end of one year there is but ¼-inch shortening. He walks with only a very slight limp; abduction and flexion are normal, and at no time has he any pain or discomfort.

The favorable results exhibited by these four patients at the end of six, nine and twelve months; the absence of deformity, pain and discomfort; the freedom of motion and their ability to resume their regular work, are undoubtedly due to the method of treatment employed.

Five other patients who have been under treatment for less than four months are up and walking with crutches. Six additional patients under treatment less than two months' duration are not yet using crutches. There is every reason to believe that the results in these cases will be as favorable as in those first reported.

In no case has it appeared that the patient was harmed by the application of this bandage. In no case did it produce pressure sloughs and require to be removed. In but a few early cases did it need to be cut away at the edges on acount of injury to the skin. The plaster bandages were applied with great care

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and patience on the part of the House Staff to whose interest and effort much of the comfort of the patients was due. In a majority of the cases the plaster bandage was not applied until several days after the injury. In six cases the patients had been under treatment in some other hospital before being transferred to Bellevue; four others had been treated at home for several days, and for other reasons this bandage was not at once applied. In only three cases was it put on within three days after the accident. Although the long side splints were in use, all of these patients complained of pain whenever any movement was made in changing the sheets, in changing from one position to another, in lifting him up to use the bed pan, etc. The side splint did not give sufficient support to prevent movement between the fragments.

However, after the plaster bandage was applied the patients found that they could move about without pain and could help themselves in many ways. The nurses appreciated the many advantages which the patients gained through the comfort of a well-applied plaster bandage. In general the patients were far more comfortable than others with similar fractures, but under the routine treatment with the long side splint and Buck's extension. From the hospital standpoint this method of treatment is less exacting in that the patients being more comfortable they do not require so much time and attention from the nurses.

Conclusions.

1. Fracture of the neck of the femur occurs under 50 years of age more frequently than was formerly believed.

2. Any injury to the hip followed by disability should suggest the possibility of a fracture of the neck, and requires an expert examination aided by an x-ray photograph.

3. Reduction of the deformity with complete immobilization of the fracture during the period of repair by means of a plaster spica bandage is advised in all suitable cases.

4. This is to be followed by *early* gymnastic movements, active rather than passive.

5. All weight bearing upon the fracture is to be avoided for from three to four months.

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THE TREATMENT OF FRACTURE AND DISLOCATION OF THE VERTEBRÆ.

By Alexander Nicoll, M. D.,

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Fracture of the spine, alone or accompanied by dislocation, while not an everyday occurrence, is still sufficiently frequent in the experience of men actively interested in traumatic surgery to merit a discussion of its treatment. The question of operative interference is also an open one and the results of such interference seem to vary to a considerable degree. There seems to be altogether too much tendency on the part of surgeons to look upon the injury, when severe, as necessarily fatal, and to decline to operate on the ground that they are "surgeons, not executioners," a sentiment that is utterly destructive to the chances of progression along this line of work.

During the course of the past summer two cases came under my care which presented some extremely interesting and instructive points, and which led me to inquire into (1) the degrees of injury to the spinal cord which we may assume to exist with different degrees of injury to its bony development, and (2) the cases as they appear clinically.

The Pathological Condition.

Presuming a fracture to exist, the following seems to be a reasonable classification of the resultant conditions:

Pathological Class I—Fractured fragments slightly or not at all depressed; membranes and cord not injured.

Pathological Class II—Fractured fragments depressed; membranes torn, with hemorrhage about the cord, but no injury to the cord itself.

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Pathological Class III—Fractured fragments considerably depressed, or the fracture accompanied by dislocation; membranes lacerated, hemorrhage about the cord, contusion of the cord itself, and slight hemorrhage into its substance.

Pathological Class IV—Fractured fragments much depressed and usually accompanied by dislocation; lacerated membranes, hemorrhage about the cord, severe laceration of the cord itself, with hemorrhage into its substance.

Pathological Class V—A combination of the above conditions in which the dislocation is the more prominent feature and in which the cord is caught and compressed by the dislocated fragments, with or without contusion or partial laceration.

These divisions are made arbitrarily, differ principally in the degree of injury, and any of the conditions may exist as the result of direct or of indirect violence.

The factors in the foregoing conditions which are productive of symptoms and the symptoms they produce are these:

1. Laceration of the cord, causing an immediate loss of the power of movement, or sensation, or both.

2. Compression of the cord, causing a gradually increasing loss of the functions of movement or sensation, or both; this compression itself may be either (*a*) immediate, due to a bony deformity established at the time of injury, or (*b*) delayed, due to the action of an unchecked hemorrhage started at the time of injury. If the former, there is very little interval between the time the injury is received and the beginning of the onset of cord symptoms; if the latter, this interval may be long or short, but is always present.

3. Laceration and compression of the cord, producing the immediate symptoms of laceration combined with the more tardy symptoms of compression.

Hence we may assume that a case of severe back injury, in which the patient presents the symptoms of cramps in the legs, burning and tingling of the skin of the legs, followed by an increasing loss of the functions of movement and sensation in those parts, is a case of compression of the cord. Again, if a man with a fractured or dislocated spinal column has immediate loss of motion and sensation in his legs, we may safely say that such a symptom-complex points accurately to laceration of the

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cord. Finally, a patient who presents the symptoms of immediate motor paralysis of the legs, followed by a gradual loss of sensation in the paralyzed parts, is clearly one in which there has been laceration of the motor area and compression of the part presiding over the function of sensation.

Thus the cases as they appear clinically divide themselves for our consideration into three classes:

Clinical Cass I—Pure compression cases, that is, those which present the history of injury to the vertebral column, and locally the signs of fracture or dislocation, followed at an interval by an increasing paralysis.

Clinical Class II—Pure laceration cases, that is, those which present the unmistakable signs of fracture or dislocation, accompanied by immediate loss of sensation and power of movement of any or all structures whose site of spinal-cord control is located at or below the point of injury.

Clinical Class III—Combination cases, that is, those which, together with the gross signs of structural injury, show an immediate loss of sensation or power of movement, followed by a progressive loss of the functions not immediately destroyed.

Treatment—A careful consideration of the mechanics of the conditions likely to be present, and the mechanical means we have for their correction, will point the way to proper treatment.

Compression cases may owe their symptoms to one of several gross mechanical conditions:

1. Immediate bony compression may be due to (*a*) dislocation or (*b*) depressed fractured laminæ.

If due to dislocation we have the remedy in our hands: an open operation with suitable manipulation will reduce the dislocation and relieve the compression. If due to fractured and depressed laminæ, the offending fragments may be raised or removed entirely, at the discretion of the surgeon.

2. Delayed compression may be due to hemorrhage (*a*) about the cord or (*b*) into the cord.

In the former case the bleeding would naturally come from the vessels of the membranes and would create compression by its limitation by depressed laminæ: the remedy suggests itself, and a proper laminectomy together with control of the hemorrhage will afford the relief desired. In the latter case the hemorrhage into the cord would be, in all probability, merely one of

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the several factors entering into the general aspect of those cases which I have designated as combination cases.

Laceration cases, pure and simple, exist, from the standpoint of treatment, only when the cord is torn completely across, and all sensation and power of movement of structures physiologically below the particular segment under suspicion, are immediately abolished. Such cases are nearly always rapidly fatal and require the exhibition of such purely humanitarian methods of treatment as are afforded by the proper use of morphine. A condition of total cord destruction, at any level, justifies non-interference. Any injury to the cord of a less extent does not, in my opinion, carry with it any such justification whatsoever.

The combination cases are the most interesting, inasmuch as they present great opportunity for the saving of life, and, in addition, are those most frequently met with. Here we have a deformity produced which is of such a character that part of the cord is immediately lacerated and the remainder compressed. The duty of the surgeon is plain. We are powerless to repair the destroyed area. Suture of the cord is beautiful in conception, but, unfortunately, absolutely worthless in practice. Compression can be relieved, and an open operation in which the surgeon attacks mechanical difficulties with mechanical means will remove the factor of compression and allow the uninjured portion of the cord segment to regain its functional activity.

Thus far I have purposely avoided discussion of the special advisability of operation in cases in which the injury affects certain different regions of the cord. I believe that any case into which the factor of compression enters, or may be expected to enter, should be operated upon, and I do not believe that the special segment of the cord involved should influence the surgeon either for or against operation. An injury to the cord even at the level of the lowest dorsal vertebra is surely sufficiently grave to require surgical intervention, and the higher the location of the injury the greater the demand for the relief which operation alone affords. The location of the injury affects prognosis seriously, but not indications for treatment. Finally, as regards the time of operation, delays are dangerous, perhaps fatal. The necessity for minutely accurate diagnosis does not exist. By all means operate at once.

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The following is a brief record of the first case I have to report:

John M., aged 43 years, a plumber by occupation, while at his work August 13, 1906, fell twenty feet from a scaffolding, and struck upon his head. He was rendered unconscious. An ambulance surgeon applied suitable dressings to his several injuries and transferred him to Fordham Hospital.

He was admitted at 6 p. m., put to bed and examined by a member of the interne staff. There were several large lacerated scalp wounds, under one of which, in the occipital region, was a linear fracture of the vault of the skull, which was not depressed, but which apparently ran to the base. In addition he had a simple fracture of the left patella. He was conscious and rational, generally contused, in shock, and complained of great pain in the neck and lower limbs. He was catheterized and three ounces of clear urine obtained. His numerous wounds were dressed, splints were applied to his injured leg, and then, unfortunately, his spinal injury was overlooked; he was given morphine and went to sleep. Upon admission his temperature was 98°, pulse 88 and small, and respirations 26.

He was next seen about 9 a. m., August 14, fifteen hours after his accident, and was found to have entire motor and sensory paralysis extending downward from a horizontal line two and one-half inches below the clavicles; complete anesthesia of the skin of both arms except over an area corresponding to the deltoid muscles; paralysis of the extensor muscles of both arms and forearms; a tendency to tonic contractions of the flexor muscles of the arms; and a fracture of the base of the skull was evidenced by extensive double sub-conjunctival ecchymosis. His respirations were entirely diaphragmatic and he had paralysis of the bladder and the rectum, evidenced by urinary continence and anal relaxation. All reflexes over the area of anesthesia were abolished.

I first saw the patient at 2 p. m. August 14, and found him in the condition indicated above. At that time his temperature was 102°, pulse rate 100, and respirations 30. His face had the peculiar waxy expressionless appearance common to cases of spinal-cord injury, and he was exceedingly weak. He had pain in his contracted biceps muscles and in his neck; otherwise he was without sensation of any sort. It looked as though the man had but an hour or two to live; temperature increasing, respirations becoming more rapid; he was weakening rapidly. It was already twenty hours since he had received his injury. He had, in addition, a serious head injury, and altogether the case appeared absolutely devoid of hope. I felt it was my duty to let him die in peace. He received stimulation of various sorts, and in the morning of August 15 his condition was markedly better. It was decided to give him what chance he had.

At 10 a. m., forty hours after his injury was received, he was put on the operating table in a right lateroprone position, and chloroform administered. I made an incision five inches in length with its centre over the fifth cervical vertebra and carried it down to the spinous processes.

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The muscles were freed and retracted laterally, giving a good exposure of the spinal column. There was fracture of the spinous process of the fourth cervical vertebra, and a dislocation forward and downward of its body upon the body of the fifth cervical. The fractured spinous process was removed, together with a portion of its corresponding lamina, with rongeur and chisel. There was a small rent in the membranes and no subarachnoid hemorrhage. By the removal of the portion of the lamina I had established a point upon which I could exert leverage.

One assistant was delegated to make traction upward upon the head, another to press backward upon the throat, and a third to press downward directly upon the spinous process of the fifth cervical vertebra. When all were ready, I inserted a curved periosteal elevator into the spinal canal, between the membranes and the posterior portion of the canal formed by the dorsal parts of the fourth and third cervical vertebræ, and at a signal we all "heaved together," and the dislocation was reduced without any trauma to the cord itself. All bleeding was checked, the muscles were drawn together slightly in the median line by interrupted catgut sutures, the fascia united with a running suture of chromic gut No. 2, and the skin closed with silkworm-gut and silk. A small rubber-tissue drain was introduced to the site of fracture. A cast was immediately applied to his head and shoulders, and the patient was placed upon a water-bed. The time required for operation was forty-five minutes, and the patient left the table in better general condition than when he was put upon it.

He recovered consciousness in about twenty minutes and immediately began to move his arms. He had regained sensation over the entire dorsal surface of his arms and forearms and also over a small area corresponding to the middle third of his biceps muscles. There was a noticeable improvement in the depth and character of the respirations, and the tonic spasms of the flexor muscles of his arms were no longer present.

In two hours his temperature had reacted to 100° and his pulse was 100 and of fairly good character. From this point on he gradually became weaker, and died, eight hours after operation, of respiratory paralysis, his heart continuing to beat for several minutes after respiration had apparently entirely ceased. No autopsy was had.

This case seems to me to be one of pure compression. He certainly had no laceration of the cord, else we would have had some immediate evidence of it at the time of his admission; that there was no hemorrhage about the cord I demonstrated at the time of operation. The deformity was very marked and was easily sufficient to have caught the cord and gradually squeezed out its life. I cannot help feel that, had this patient been carefully watched and the first symptom of compression noted, operation at that time would undoubtedly have saved the man's life, and in all probability have restored him to complete functional activity.

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My second case has had a more fortunate termination, and this in spite of the fact that his injury was more severe. The history is as follows:

Joseph D., about 35 years old, a carpenter by trade, was leaning out of a window of a building then in the course of construction, when he was struck on the back by an iron beam which weighed about three hundred pounds and which fell ten feet. He dropped back into the room unconscious. He regained his senses almost immediately and found himself unable to move his lower limbs. An ambulance carried him to Fordham Hospital. His temperature on admission, August 28, 1906, at 9 a. m., was 99°, his pulse 96, his respirations 32.

He was a well-nourished man. His face bore the peculiar waxy expressionless look common to cases of this nature; the heart sounds were feeble and the pulse was small; respirations were shallow. The neck and upper extremities were normal. He was conscious and rational. Being unable to void urine he was immediately catheterized and several ounces of slightly pink urine was obtained. An enema, given to him shortly after admission, was returned slowly and without feces. He was unable to move his lower limbs; had a girdle sensation at the umbilicus, and irregular spots of anesthesia and paresthesia over the lower portion of his abdomen, and both thighs, legs, and feet. The knee-jerks were entirely absent. Priapism was present. He complained of tingling and burning in the lower part of his abdomen and in the thighs, legs, and feet, and intense pain in his back. On a line with the tenth rib there was a depression in the median line of the back, and a point of great tenderness.

I saw the patient at 10.30 a. m., two hours after the accident. He was in about the condition described above except that the anesthesia was becoming more complete. I advised operation. At 1 p. m. the patient was very weak, temperature 97° by rectum, pulse 72 and very small, and respirations 26. He was completely anesthetic from the umbilicus down. At 2.30 p. m. he consented to operation. Immediately before he was put upon the table he was again catheterized and four ounces of bloody urine was obtained.

At 3 p. m., six hours after the time of the injury, he was taken to the operating-room, placed upon the table in a right lateroprone position, and chloroform was administered. I made an incision six inches in length, in the median line of the back, with its centre over the depressed area. Cutting down to the spinous process the muscles and fascia were found ecchymotic. At the situation of the ninth dorsal vertebra there was a marked depression in the line of the spinous processes and those belonging to the eighth, ninth, and tenth dorsal vertebræ were evidently broken. The last two ribs on the left side were broken and the end of the twelfth rib was jammed into the region of the kidney on that side; the tenth dorsal was dislocated forward upon the ninth. Attempt at reduction at this point was defeated by impaction of the fragments. I removed the spinous processes of the tenth and ninth vertebræ, together with their corresponding laminæ, and found the membranes torn to pieces. From the position of the spinal cord it was evident that it had been pressed upon

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by the fractured laminæ just removed, and it appeared to be contused. My second attempt at reduction by manipulation and traction by means of strong bullet forceps, applied directly to the vertebral body of the tenth dorsal, was successful.

With the bodies of the vertebræ in line, the spinal cord in its proper place, and compression due to secondary dislocation guarded against by the removal of the laminæ of the tenth and ninth dorsal vertebræ, I considered that I had done all that could be done at that point. The region of the wounded kidney had ceased bleeding. The wound of operation was rendered as dry as possible, and the right and left erector spinæ muscles were drawn together in the median line with interrupted sutures of catgut. The fascia was sutured with chromic gut No. 2, and the skin closed with sutures of silkworm-gut and silk. A small rubber-tissue drain was inserted at the middle of the incision and carried down to the point of fracture. The patient left the operating room in good condition and was immediately put upon a water-bed. The time required for operation was sixty-five minutes.

He rested nicely that evening and night, and the following day I applied a plaster cast to his body, extending from the axilla to the knees, and removed the rubber-tissue drain. The experience of putting on the cast was very painful and trying for him, and during the time required for its application his pulse gradually quickened until it reached 180 to the minute. He also complained of great precordial pain. Hence his condition twenty-four hours after operation was not encouraging. His temperature was 102°, pulse 180, respirations 36. The urine contained much blood; twenty ounces in twenty-four hours by catheter. He was being vigorously stimulated, chief reliance being placed on saline and whiskey enemas, and strychnine hypodermically.

On the third day his condition was unchanged.

On the fourth day he was improving; by the eighth day his temperature was 98°, his pulse 92, and his respirations 20. Twenty-six ounces of pale, pinkish urine was obtained by catheter in twenty-four hours.

From this time there was no change until the tenth day, when he began to have irregular sensations of pressure and tingling in his legs and thighs.

On the eleventh day his general condition was good. He began to have painful sensations in his legs.

Later notes are as follows:

Fifteenth day: Wound dressed and found absolutely clean, with no stitch infection. Sensations better and improvement in left leg more rapid than in right. Urine now clear and normal in amount. Bowels moving after enemas. Catheter still necessary.

Nineteenth day: Patient beginning to have a little irregular temperature, since seventeenth day. Has slight cystitis. Bladder irrigations of boric acid twice daily.

Twentieth to twenty-eighth day: Cystitis has not grown any worse, but temperature has gradually increased in severity during the past week. Wound examined today and several spots of budding granulations along

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its course discovered. Apparently catgut infection. Openings slightly enlarged.

September 29, 1906, twenty-ninth day: Temperature normal. The cystitis is somewhat troublesome and tends to grow worse.

September 30: Patient anesthetized and an external urethrotomy done. Continual drainage afforded.

October 2: Patient in good condition. Cast removed.

Since that time the patient has steadily improved. Sensation is good in his entire left thigh, leg, and foot. His right thigh has some irregular spots where the sensation is not good. With the exception of these he has entirely regained his normal power of feeling. Motion has never shown any tendency to return. His skin is well nourished and there is remarkably little muscular atrophy. His wound of operation is entirely healed. His perineal wound is clean and granulating. He is not able to void urine. He feels well and looks well.

November 6: Patient was allowed to sit up in bed, and did so without experiencing any discomfort. In spite of the fact that he is paralyzed from his waist down, as far as movement goes, he is particularly pleased with the fact that he is alive.

In regard to the operation itself there are some points which suggest themselves:

1. Nothing is gained and time is lost by a small incision.

2. No more bone should be removed than is absolutely necessary to provide proper exposure of the cord and a reduction of the dislocation.

3. If the membranes are found intact an aspirating needle will demonstrate the presence of blood beneath, and the membranes should not be incised needlessly.

4. The membranes should be closed, if possible, with a fine catgut or silk suture.

5. Drainage should be provided for any oozing that may take place from the wound of operation. A rubber-tissue drain is sufficient for this purpose and should be removed at the end of twenty-four hours.

6. An immediate external urethrotomy should be done and continual drainage provided for the bladder.

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REPORT OF TWO MONTHS' SERVICE AT BELLEVUE HOSPITAL.

By Frederic S. Dennis, M. D., F. R. C. S.

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During the months of October and November, 1906, the service at Bellevue Hospital was of unusual interest for two reasons. In the first place, the mortality in the cases operated upon was so low that it is worthy of publication. In the second place, the repair of wounds was characterized by the entire absence of pus, and so aseptic was the healing that stitch abscesses were unknown. These remarkable results were due largely to the skill and faithfulness of the House Surgeon, Dr. McKenzie, and his staff, together with the vigilance and care of the trained nurses in the wards.

The cases treated during October and November were as follows:

Fractures—Skull (simple), 3; skull (compound), 1; nasal bones, 2; humerus (surgical neck), 2; radius (Colles), 2; metacarpo-phalangeal (compound), 2; vertebræ (spinous process), 1; ribs (simple), 2; ribs (laceration of lung), 1; pelvis, 1; femur shaft (simple), 6; femur (shaft, compound), 1; femur (neck), 6; tibia and fibula (simple), 4; tibia and fibula (compound), 4; tibia (simple), 4; fibula (simple), 3; fibula (Pott's), 12; fibula (with dislocation), 1; fibula (compound), 1; astragalus, 1; sprain of ankle joint, 3; metatarsal, 3; intracranial injuries; cerebral hæmorrhage, 2; laceration of brain, 1; laceration of thigh, 1; intraspinal injuries (spinal hæmorrhage), 3; gangrene of toe, 3. Total, 76.

The list of cases operated upon during the months of October and November, 1906, was as follows:

Trephining (compound fracture of skull), 4; adenocarcinoma of breast, 2; congenital malformation of jaw, 1; old and ununited fracture of the ulna with resection of a part of radius, 1; genu valgum, 2; old and ununited fracture of tibia and fibula

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(wired), 2; cholangioitis (catarrhal), 1; appendicitis (catarrhal), 1; appendicitis (with adhesions), 1; appendicitis (suppurative), 1; appendicitis (gangrenous), 3; hernia (Bassini), 19; vesical calculus (suprapubic), 1; punctured wound of abdomen with splenectomy, 1; varicose veins of leg, 8; necrosis of lower jaw, 2; necrosis of sternum, 1; tubercular knee joint (resection), 1; osteitis media (suppurative), 1; abscess of alveoli, 1; cyst of mammary gland, 1; sacrococcygeal cyst, 1; prolapse of uterus with ruptured perineum and lacerated cervix, 2; retroversion of uterus (Alexander), 2; salpingitis and ovaritis, 2; ectopic gestation, 2; gunshot wound of the skull, 1; hypertrophied tonsils with adenoids, 1; hæmorrhoids, 6; fistula in ano, 2; noma (cancrum oris), 1; intestinal obstruction, 1; cellulitis, 5; lacerated wounds of extremities, 19; bursitis of knee, 1; minor surgical operations, 51; amputation of thigh (osteomyelitis), 4. Total, 156.

Mortality—Excepting cases from injury, which died within a few hours after admission, there were only three deaths, as follows: First, a gangrenous suppurative appendicitis with general peritonitis. This case did well after operation. Temperature was normal seventeen days after the operation and the abdominal wound was practically healed. On the seventeenth day the patient had a chill and developed lobar pneumonia, from which she died with a temperature of 106 F. on the eighth day of the pulmonary disease. Second, compound dislocation of the ankle joint, in which tetanus developed on the seventh day; the patient died twenty-four hours later. Third, lacerated wound of the thigh from a railway accident, 18 inches long and reaching to the bone. The wound became infected with bacillus ærogenes capsulatus on the fourth day after the admission, and the patient died on the twelfth day.

From the above tables it appears that there were seventy-six cases treated during October and November, 1906, and 156 cases operated upon during this period. The mortality of the cases treated was about 2 per cent., while the mortality of the cases operated upon was less than 1 per cent. If the one death following twenty-five days after the operation for appendicitis, and due to a lobar pneumonia be eliminated, since the abdominal wound was practically healed and the temperature normal for eight days, the mortality in the 156 consecutive operations was zero. In addition to the zero mortality, which in itself is most remarkable, there was another feature most gratifying. In all

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the cases operated upon there was not a stitch abscess. The length of wounds sutured has been measured from time to time, and the results show that if these wounds were measured out there would be a wound equivalent to twenty-seven feet in length, sutured without a single stitch abscess. Further, there were several wounds sutured, which at the time of admission were suppurating, but after operation rendered so aseptic that they all healed without any further suppuration.

Among the cases of special interest, were two of ectopic pregnancy; in one case with hæmorrhage into the peritoneal cavity, and in the other into the folds of broad ligament. Both of these cases did well although the first case was one of myxœdema.

The compound fracture and dislocation of the ankle joint was a most serious injury. The joint was wide open, all the tendons exposed, the ligaments torn and the astragalus protruded through the opening. The dislocation was reduced by pushing back the astragalus under general anæsthesia, and the wound made aseptic with free provision of serous drainage by a large tube across the joint. The loose tissue was removed and an aseptic dressing placed over the wound over which a plaster splint was applied with a large fenestrum. Upon the fourth day the wound was dressed and found to be clean. On the sixth day the patient complained of some stiffness of the jaw, and on the following morning was unable to move his jaw. The tetanus developed very suddenly; 20 cc. of antitoxin was injected into the spinal cord and 20 cc. into the vein at the elbow. Morphin was given hypodermatically to relieve his pain and the wound treated with iodine preparation. The patient died twenty-four hours later in great agony.

The results obtained in the surgical ward are due to the rigid adherence of fixed rules from which no deviations are made, from the most insignificant operative case to the most serious. Before any operation is performed upon any patient, a family history is taken as well as the history of the case; special enquiry as to venereal disease and alcoholism is made. This seems necessary as a preliminary step in determining the proper anæsthetic to employ, the peculiar conditions which might influence the post-operative constitutional treatment of the patient, and the local management of the wound itself. A physical examination is then made of the heart, lungs and kidneys. Blood analysis is made in most cases.

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There are also certain rules which govern the house staff as regards all operative procedures. The house surgeon never dresses any suppurative cases unless there is some special reason, in which case he always wears rubber gloves. This class of wounds is relegated to the junior upon the staff, who thus comes in contact with all pus cases. By this rule all clean cases, both pre- and post-operative, are cared for by the house surgeon and occasionally by the senior assistant, whose chief duty in all operations is to hand instruments. If a vaginal or rectal examination is necessary, this is always made by the surgeon, who wears rubber gloves. The head nurse in the wards or in the operative ampitheatre takes no part in the dressing of suppurative cases. In this way every operation that is not septic is performed under conditions which ensure the success as to primary healing.

The preparation of the operating room is a necessary adjunct to all operations. The floor, wall, and tables are mopped with a 1-20 carbolic acid solution, and all pans, dishes, irrigators and, in fact, all apparatus necessary in the operation, are rendered sterile by boiling for thirty minutes, while the catgut and kangaroo tendon are obtained in sterile receptacles from the manufacturer. The rubber gloves are thoroughly washed with green soap, wrapped in sterile towels and boiled for twenty minutes before operation with steam under fifteen pounds pressure. The surgeon's hands, as well as those of the nurses, are made aseptic, and the gloves applied over the hands which have been sprinkled with sterile powder. All gauze, sheets, wipes, pads, etc., are sterilized by steam immediately before the operation. These last articles are generally sterilized twice, once when they are first done up, and again just before they are used. At the completion of the operation, the instruments are washed and cleansed of blood and then boiled for half an hour and taken apart, dried, and kept in a clean cabinet for future use. Inhalers and mouth forceps are taken apart and cleaned after every operation, and boiled again before they are used for another operation. This is a most important step as a preventative of ether and post-operative pneumonia. The patient's teeth are cleaned, and an antiseptic mouth-wash is employed before the anæsthetic is given.

The preparation of the patient is especially important as a part of the routine detail in all operative procedures. The night

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previous to the operation a cathartic is administered. The kind of cathartic is determined by the special case, but usually two compound cathartic pills are given, unless otherwise ordered in the afternoon previous to the operation. The morning of the day of the operation a half ounce of sal Epsom is given, and followed in two hours by an enema until return flow is clear. No food is given from supper on the day before until after the operation. The field of operation is thoroughly scrubbed with tincture of green soap and hot water by the nurse with sterile hands, who uses sterile gauze instead of a nail-brush. The field is then flushed with sterile water so as to remove the soap, and again flushed with a 1-3000 bichloride solution, and finally with sterile water. The part is then covered with sterile towels, which are left on until the patient is placed upon the operating table. Some special means are employed in cases of stomach, gall-bladder, and intestinal surgery.

The preparation of the patient for any special operation depends upon the character of the operation to be performed. In a laparotomy, for example, the technique is different from what it would be for trephining, or for amputation. The preparation of the field for operation has already been described. The surgeon scrubs his forearms and hands for five minutes with sterile brush and with hot water and tinctures of green soap. Fingernails are cleaned with a sterile orange stick, then the hands are rubbed with lime and soda for three minutes, and then rinsed in sterile water. They are then immersed in a 1-3000 bichloride solution of mercury for two or three minutes, and finally rinsed again in saline solution, dried, and the rubber gloves applied as well as a sterile cap and gown.

The post-operative treatment of wounds is very simple as they are not disturbed for six days, unless there is pain or tension in the wound, or elevation of temperature. The stitches are removed upon the sixth day with every aseptic precaution. Dry sterile gauze is now applied for a few days until the wound is firmly healed. Special emphasis must be laid,

1. Upon the distribution of work among the members of the house staff so that only one comes in contact with pus cases.

2. The special sterilization and preparation of the inhalers before operation.

3. The elimination of all irritating antiseptic solutions before and after the operation.

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4. The cleansing of all instruments before their sterilization.

It is thus evident that a cursory review of the cases treated and of those operated upon shows that in the list were many of a most serious nature. Many of the cases, too, were suffering from chronic alcoholism as well as venereal disease, and most of them were patients whose constitutions were broken down by poor nutrition, and who had been living in an environment that was far from hygienic. Notwithstanding these unfavorable surroundings, these patients have recovered under circumstances not favorable to a low mortality or to aseptic healing.

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NAILING THE LOWER EPIPHYSIS OF THE RADIUS.

By H. A. Haubold, M. D.,

Clinical Professor in Surgery, New York University and Bellevue Hospital Medical College; Visiting Surgeon, Harlem Hospital.

The case here reported was diagnosticated before the skiagram was submitted, as it presented no great problem. The one point which ultimately resulted in a favorable outcome, however, was brought out by a study of the skiagram and the measure for relief decided on.

History—C. N., aged 15, was admitted to Harlem Hospital July 6, 1908, with a history of having fallen from a rapidly moving trolley car. In an effort to save himself he held the right hand forward and the force of the fall was received on the palm. The ambulance surgeon who saw the boy soon after the injury diagnosticated a fracture of the lower end of the radius with lateral displacement. The boy had also sustained a small scalp wound and some minor contusions. The latter were of little import, however, and after an unsuccessful attempt at reduction of the deformity at the forearm the patient was admitted to the hospital.

Examination—After the members of the house staff and I had made an examination and a second attempt at reduction by manipulation was made, the forearm was skiagraphed by Dr. W. H. Stewart. The results are shown in Figs. 1, 2 and 3. Fig. 1 shows the lower radial epiphysis displaced to the radial side and a small portion of the shaft of the bone carried with it. The case was regarded as one of epiphyseal separation with lateral displacement, and after the second attempt to effect a reduction had failed the patient was anesthetized and a forcible attempt at reduction made. This proved ineffectual, however, despite the fact that the limb was placed on a sandbag, and the lower fragment sharply struck with a mallet.

Close study of the skiagram led to the conclusion that the displacement was the result of the pushing of the lower end of the shaft toward the ulna, and that this, rather than the radial displacement of the lower fragment, was the cause of the deformity. This view was strengthened by the over-lapping of the radius on the ulna. It is this point which emphasizes the value of skiagraphy in this class of cases.

Reprinted from the Journal A. M. A., 1908, Vol. LI., p. 1330.

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Treatment—On July 10, 1908, a curved incision with the concavity downward was made over the radial side of the fracture and the flap turned downward. This incision was made to obviate the presence of the scar at the site of the bone trauma, a desirable accomplishment, and one which should be employed whenever feasible. A stout tenaculum was hooked around the lower end of the shaft of the bone and by traction

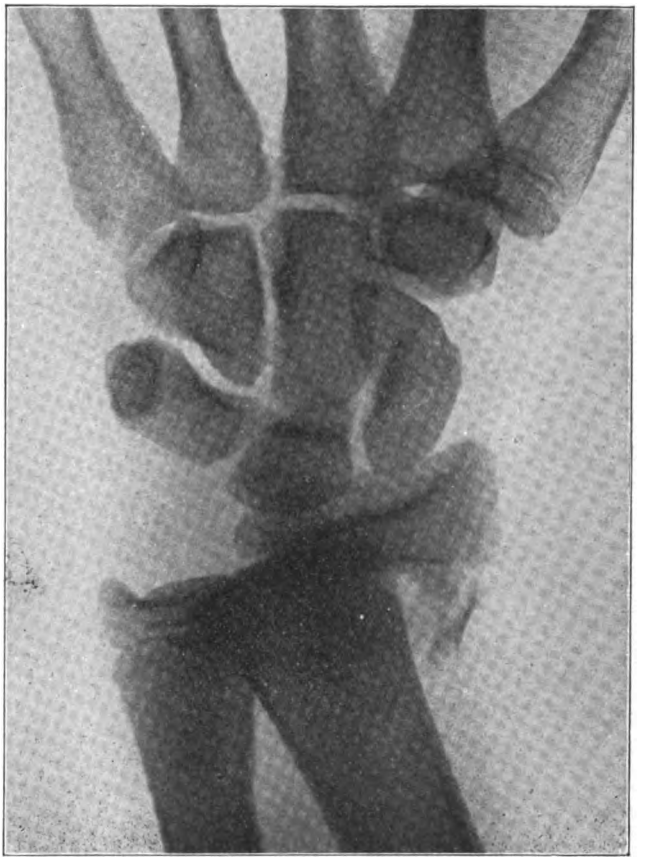

Fig. 1.—Skiagram showing radial epiphysis displaced to the radial side and a small portion of the shape of the bone carried with it.

brought into apposition with the lower fragments. The deformity, however, recurred as soon as the traction was released. A steel nail one and a quarter inches in length and a sixteenth of an inch in diameter was then driven through the fragments in the manner shown in Fig. 2. This effectually prevented recurrence of the deformity. The nail was forced into place with a steel, lead-covered mallet. The limb was then encased in

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a plaster-of-Paris cast through which the negative shown as Fig. 2 was taken. The position of the hand is also shown here. It will be noted that the deformity was not entirely overcome at the end of the operative procedure, but that when union was complete the slight overriding was entirely corrected. No doubt the position immobilization is responsible for the additional correction, as shown in Fig. 3. The nail was removed

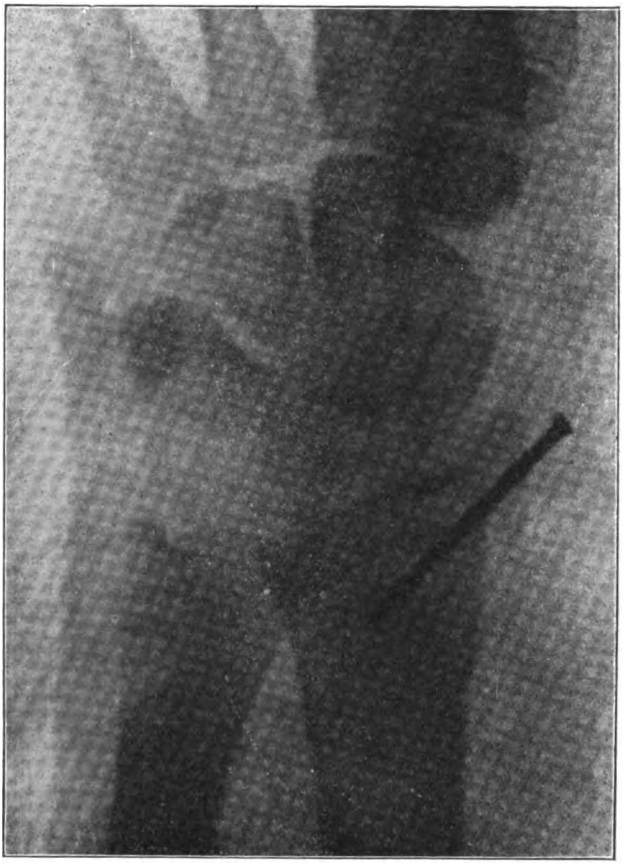

Fig. 2.—Skiagram showing the detached fragment nailed to the shaft of the bone.

at the end of three weeks and the limb immobilized, leaving the wrist joint free. A Pagenstecher thread had been placed around the head of the nail and brought out through a small incision in the skin flap immediately over the head of the nail, with the view ultimately, of extracting the nail by this avenue. The thread was broken in the attempt, how-

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ever, and it was necessary to withdraw the nail with a slender forceps. This presented no difficulty. The functional result is perfect. The anatomic result is shown in Fig. 3.

As a general proposition the operative treatment of fractures is not widely employed, nor is this case submitted with the view of encouraging the indiscriminate employment of the open

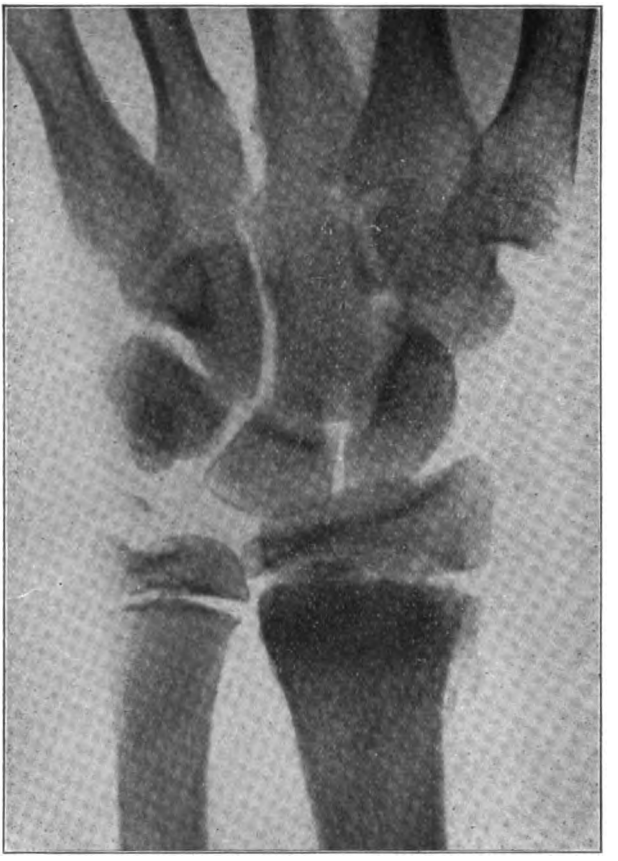

Fig. 3.—Skiagram showing anatomic result of treatment.

treatment of fractures. It is offered, however, as showing what the possibilities are when deformity can not be overcome in the usual manner. The danger of infection need only be borne in mind to forestall its occurrence.

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EXTENSIVE AVULSION OF SCALP—REPORT OF A CASE TREATED BY PLASTIC REPAIR AND FOLLOWED BY TETANUS WITH RECOVERY.

By H. A. Haubold, M. D.,

Professor in Clinical Surgery, New York University and Bellevue Hospital Medical College; Visiting Surgeon, Harlem Hospital.

The case forming the text of the following communication illustrates certain points in the treatment of conditions which, while not frequently met, may and do occur in the practice of most surgeons, and, although no new principle is submitted here, the application of accepted ones deserves mention. Following so closely on the excellent summary* of the treatment of tetanus with serum by Jacobson of Syracuse and Pease of Albany, a discussion of greater length in this connection would burden unnecessarily the literature and serve no useful purpose. In looking over the cases forming the basis of Jacobson's and Pease's work it would appear that they, like all of us who compile and deduce from the publications of others, were confronted with the fact that most important details are lacking in the reports of cases submitted by the various authors, and if this contribution seems somewhat protracted it must be ascribed to my desire to escape the fault of inaccuracy which may be the outcome of an effort to be brief.

Case.—B. S., aged 7, was admitted to Harlem Hospital July 16, 1906.

History—On the day of admission the patient had been knocked down by a trolley car, the fender of which pushed the lad along for a considerable distance, his head was ground along the rail and the scalp torn off from the left side of the skull.

Examination—This disclosed a denuded area measuring about four by five inches. The wound was symmetrically egg-shaped and the periosteum corresponding to the surface indicated was also avulsed. The edges of the wound were deeply stained with the mixture of mud and grease which covered the street in the vicinity of the car rails. There were many contusions over the entire body, but at no place, other than the scalp, was the

* Ann. of Surg., September, 1908.

Reprinted from the Journal A. M. A., 1908, Vol. XLVIII., p. 1429.

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skin broken. There was considerable shock, but no evidence of cerebral involvement and no bones were broken. Reaction from shock was rapid and complete in a few hours.

Operation—The wound was cleansed and dressed in the usual manner, and eight days after admission a plastic operation for repair for the scalp was made. The entire wound, fortunately, was within the hair area of the scalp, and permitted of the application of a flap-sliding method practiced by Volkmann and Messner. A study of the accompanying illustration will make the method employed sufficiently clear to render unnecessary further attempt at elucidation in the text. Mention may be properly made here, however, that early plastic operative effort, in injuries with considerable loss of substance, is a wise measure and should perhaps be more frequently performed than is usually done. More especially is this the case when ultimate cosmetic effect plays an important part in the problem presented. In this instance the flaps were all taken from portions of the hairy scalp, so that, when healing had taken place, there was no visible evidence of the injury. In this case delay may have seemed permissible on the ground that necrosis of bone would be the result of the loss of periosteum. It is, however, to be remembered that the external table of the calvarium is supplied with nutrition by the diploë, and that extensive necrosis rarely follows even severe and extensive injuries to the scalp and periosteum. Indeed, this is what happened in our case, if the rapid repair of the injury is to be regarded as an indication of the absence of this complication. There were no disturbances of importance following the operation, and repair seemed to progress satisfactorily.

Postoperative History—On August 3, nineteen days after receipt of the injury, the patient complained of pain in the throat and inability to open the mouth fully. Up to this time the rectal temperature had been about 99.5 F., and indeed showed no increase at this time, but the pulse rate, which had up to this been about 80 per minute, rose to 98. The latter symptom we regarded as indicative of the first expression of toxemia.

The following day the mouth was firmly closed, but could be opened sufficiently for the purpose of taking food. While protruding the tongue for inspection a spasm of the muscles of mastication caused the tongue to be bitten. The pulse rate remained near 100, but there was still no rise of temperature beyond that mentioned.

On August 5, about forty-eight hours after the first manifestations, the temperature rose to 103 F., and several convulsions of moderate severity occurred in rather rapid succession; the rigidity extended to the entire body and the pulse rate rose to 128 per minute. There was no disturbance of cerebration. The wound, which up to this time had been healthy, lost its bright red color; the granulations looked flabby and there was some secretion, but no pus, discharged from the raw surfaces. The line of union of the flaps remained firm, however, and did not at any subsequent period break down. I concluded that this was a clear case of tetanus, which, because of the long period of incubation (nineteen days), its gradual development and rather moderate expression, would probably run a rather favorable course. On this day the house surgeon administered antitoxin

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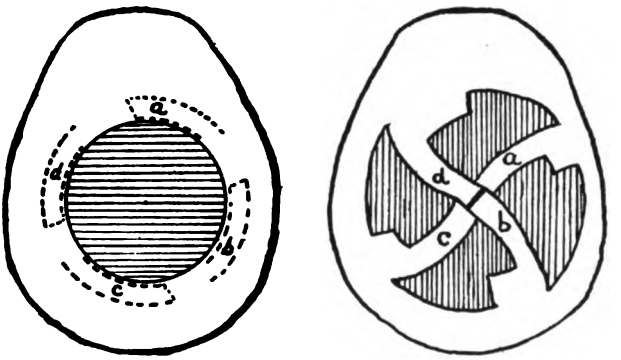
in two injections of 7 c.c. each into the buttock and one injection of 10 c.c. into the spinal canal. In the latter instance about an equal amount of spinal fluid was previously withdrawn. During the night an injection of 20 c.c. into the spinal canal was made.

On August 6 the rectal temperature was about 103 F., and the other symptoms about the same. There was rigidity and occasionally a slight general muscular spasm, but the mouth could be opened for nourishment. Twenty c.c. of the antitoxin were injected into the spinal canal.

On August 7 Dr. S. J. Meltzer saw the case with me. The temperature was still about 103 F., and the pulse rate 138 per minute. There was rigidity of all the muscles, but no distinct opisthotonos. The mind was clear; there were some sordes on the lips and the cornea was dull. The patient at this time had received 14 c.c. of the antitoxin injected into the buttock and 50 c.c. injected into the spinal canal, in four days. I had Dr. Meltzer see the case with the view of determining the advisability of making injections of magnesium sulphate solution into the spinal canal.

Following the publication of Meltzer's experimentation with magnesium sulphate injections into the spinal canal for the purpose of producing anesthesia and my own observations on human beings, Blake of New York City had used the salt in tetanus and found that spasm was controlled as the result for from twenty-nine to thirty-seven hours.



Volkmann's Plastic Repair of Scalp. (From Tillmann's Surgery.)

After examining our case, it was concluded that there was no special indication for the use of the magnesium sulphate, as spasm was not a marked symptom, and that if any unfavorable outcome was to be anticipated, it was probably more as a result of a general enfeebling toxemia, which seriously interfered with metabolism, and not as the outcome of a specific effect on the central nervous system. It is this conclusion which perhaps makes the report of this case valuable. All of us are inclined to look at our cases from the standpoint of what generally happens, and may thus be led to employ a measure which has a distinctly important office in most cases of a certain kind, when in a particular instance the special indication lies in another direction.

Dr. Meltzer suggested giving one intravenous injection of 200 c.c. of antitoxin on the theory that it was through the circulation that we should

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attack the disease. At the same time it was borne in mind that the blood already contained an antitoxin of its own creation, and that this rather heroic dose should not be repeated hastily, for fear of poisoning the patient with antitoxin. Accordingly, the patient was placed under chloroform narcosis; the median cephalic vein was exposed and 200 c.c. of the antitoxin slowly and carefully injected into the circulating fluid. That evening the rectal temperature had fallen to 99 F. and the pulse was 96 per minute. The next day the patient had no spasm and the muscular system was less rigid.

On August 9, forty-eight hours after the intravenous injection, a slight convulsion occurred and the jaw became very rigid again. The symptoms, however, were not alarming.

On August 10, three days after the intravenous injection, there was considerable rigidity and a more severe spasm. Twenty c.c. of antitoxin were injected into the spinal canal; the general condition was about the same.

On August 11 the wound was dressed and appeared healthy. The patient had been very quiet, but when disturbed had a distinct opisthotonos. Twenty c.c of antitoxin were injected into the spinal canal.

By August 14 there was still some rigidity, but no spasm for forty-eight hours. Trismus still persisted, but the general condition was favorable; the pulse was between 90 and 100 per minute and the patient took nourishment by mouth.

On August 15 (the twelfth day of the disease) the patient had a convulsion and his temperature rose to 104 F., with the pulse 124. An intraspinal injection of 20 c.c. of antitoxin was given, and during the night the temperature dropped to normal.

From that time on the patient's condition gradually improved, although there was some trismus which persisted for several weeks after he was up and about. No more antitoxin was given.

Throughout the treatment the patient received 14 c.c. of antitoxin into the muscles; 100 c.c into the spinal canal and 200 c.c. into the venous circulation.

The wound of the scalp healed completely, without untoward symptoms, beyond the unhealthy appearance alluded to, which occurred when the toxemia was perhaps at its height. This is probably ascribable to the modification of nutritive processes which occur during a toxemia.

The case may be regarded as teaching us that early plastic repair in extensive loss of substance is a wise measure; that, when muscular spasm is not a marked symptom, magnesium sulphate need not be administered and that in a certain class of cases, such as is represented in this instance, the toxin of the disease may be counteracted by the introduction of a considerable quantity of antitoxin directly into the blood current.

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SOME REMARKS ON TRAUMA OF THE ABDOMEN, WITH REPORT OF A CASE OF RUPTURE OF THE LIVER.*

By Albert E. Sellenings, M. D.,
Assistant Visiting Surgeon, Gouverneur Hospital.

The favorable outcome of a case of rupture of the liver surgically treated seems sufficient occasion to warrant a brief consideration of some of the points in connection with trauma of the abdomen, and more particularly some of the features accompanying fracture of the liver. The treatment of subparietal injuries of the abdominal viscera, the diagnosis once made, is fairly well established, but the diagnosis is, however, often of difficult conclusion, and the indications for operative interference are by no means clear. The writer has had the privilege of observing a considerable number of cases of abdominal trauma, and has been struck with the vagaries in the symptomatology and with what logically follows, namely, difficulty in certain or exact diagnosis. With no symptoms or train of symptoms to guide to anything positive, it is fair to admit that exploratory laparotomy has been a frequent procedure in this class of cases under discussion.

The etiology in these cases is varied, and involves on the part of the patient different states of rest or activity, and on the part of the vulnerating agent differences as to source and motility. On the part of the individual is to be considered the condition of the abdominal parietes, as to whether or not he be developed as to muscles, and whether or not the abdominal wall be padded with adipose tissue. It is important to consider whether the hollow viscera be full or empty, and whether the solid organs be congested or otherwise. Again whether the agent of trauma had been met with expectancy as evidenced by a voluntary contraction of the abdominal muscles. On the part of the vulnerating agent it is important to consider whether it be of slow moving energy or rapid; whether it be of the nature

* Read before the Hospital Graduates' Club of New York City October 25, 1906. Reprinted from the New York Medical Journal for January 19, 1907.

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of crushing, as in the slow passage of a wheel over the abdomen, or whether it be a blow quickly delivered, as in the case of a kick by an animal. An abdominal wall which is muscular or padded with fat will, to a great degree, dissipate the force of the vulnerating agent with the result that the maximum of damage is done to the abdominal wall alone. However, with an agent of great weight and velocity this physical status of the individual is overwhelmed and cannot and does not serve to fully protect the contained viscera. While it must be admitted that some of these mechanical considerations may have but a theoretical basis and cannot always be applied at the bedside, still in doubtful cases with no definite symptomatology in evidence, they will serve as the only evidence for appropriate treatment. In children in whom the resisting powers are negative as far as the before mentioned physical condition of the abdominal wall is concerned, it will be found that a consideration of these mechanical principles forms the most important and sometimes the only suggestion towards surgical interference.

That the recognition of the true lesions after abdominal injury is a most difficult problem has already been indicated. The resulting symptoms may be at once so meagre or varied that no symptoms or group of symptoms are of avail in establishing a diagnosis in the majority of cases. Shock, in the usual conception of the term, may be present in various degrees of depth. It may, on the other hand, be entirely absent. Shock is an elastic term and expresses nothing definite, since the individual susceptibility and resistance enter as important factors, making the measure of shock even, when present, an almost impossible working entity. In this connection is meant the initial shock of trauma. Closely allied to shock is the condition of internal hemorrhage, the symptoms of which are difficult to distinguish from shock. In fact, the two conditions are one and the same thing, as far as the clinical picture is concerned, though different in etiology; shock *per se* being brought about by a disturbance primarily of the nervous system, and hemorrhage by a damage to some portion of the circulatory apparatus. In the case of shock, through paralysis of the vasomotor centres, the blood pressure is reduced, whereby the abdominal vessels are highly congested, together with a dilatation of the right heart, and in the case of hemorrhage, it is reduced by an actual escape of the blood volume from the usual channels. The differentiation of the two conditions then may present no little difficulty. The degree of

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shock is not always commensurate with the injury inflicted. The following case illustrates an exhibition of but little shock from a combination of several injuries:

CASE I.—Y. G., age 35, was admitted to the hospital on August 17, 1904. While lighting a fire with kerosene, her clothing caught fire, and in the excitement occasioned by the event she leaped from the fourth story of the tenement in which she lived. Examination of the patient after admission to the hospital revealed extensive burns of the back and upper extremities; there were also presumably internal injuries. The patient exhibited no shock and was comfortable, except for indefinite pains in the left hypochondrium. This pain was deeply situated and intensified with respirations and deep pressure. Taking into consideration the history of the injury and the presence of deep pain, laparotomy was decided upon, and there was disclosed a rupture of the spleen, together with a rent about four inches in the diaphragm. There was a considerable amount of free blood in the peritoneal cavity.

The usual statement that severe shock follows injury to the diaphragm, especially in the cardiac region, was not corroborated in this case nor in the other cases of the same lesion that have been observed. In general it would seem from personal observation, that shock *per se* is not a constant feature in these cases of trauma of the abdomen. As a result of severe and progressive hemorrhage a condition of shock may supervene, to which condition the term collapse is applied. In such cases, shock and internal hemorrhage become synonymous. Examples of severe shock following trivial injuries are familiar occurrences and need not have special mention.

The symptoms of internal hemorrhage exhibited by the rapid, small, soft pulse, increased sighing respirations, air hunger, anæmia, thirst, etc., present a very suggestive picture, and will suffice to warrant surgical action without the development of other signs. However, with hemorrhage occurring slowly, the patient may show but little evidence of the same, until eventually when a quantity of blood has been lost with subsequent lowering of arterial tension, the more serious symptoms appear. A case recently coming under observation illustrates a slowly occurring hemorrhage with no severe early symptoms of either shock or hemorrhage. In addition it emphasizes the necessity of close observation in all cases in which there is definite history of severe trauma.

CASE II.—A boy, 12 years of age, was run over across the abdomen by a public carriage on September 5, 1906. He was taken to a hospital near the place of accident, but was refused admission, since his condition was not deemed of sufficient moment for observation or treat-

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ment. Twenty-four hours later when seen by a private physician his condition was such that his removal to the hospital was advised. On admission the boy showed so called moderate shock, with all the signs of internal hemorrhage. His temperature was 101°, and the pulse ranged from 124 to 130. There was subjective pain just above the umbilicus. The abdomen was somewhat tympanitic, there was no rigidity or tenderness. The abdomen was opened in the middle line and the pertioneal cavity was found filled with blood, which was washed out with saline solution. Behind the peritonæum on the left side was marked hemorrhage. Examination of the spleen showed it to be severely ruptured and its removal was decided upon. Further examination, however, revealed the remarkable fact that it was lying entirely severed from its vessels with no active hemorrhage taking place. Clotting in the splenic vessels had evidently prevented further bleeding. The spleen was easily removed and gauze packing placed at its former position. It was impossible to recognize and ligate the splenic vessels. The boy never rallied and died the same evening. Had he been more closely observed following the accident, the necessity of intervention could have been appreciated earlier, with a good basis for favorable prognosis.

The symptoms of pain, tenderness, and muscular rigidity usually given as characteristic symptoms of these conditions are not absolute. The constant presence and association of these symptoms, as far as my own experience is concerned, is the exception rather than the rule, although on theoretical grounds they ought perhaps to be present. Pain of a deep boring nature which radiates to the back, must, when present, be taken as a sign of some weight. Again, pain may be absent in cases presenting the most severe lesions, and its absence cannot be entirely explained by the association of shock which dulls the sensibilities. Pain when present may not offer assistance in the localization of the lesion, since it may be quite remote from it. As, for example, in a case of rupture of the bladder the pain, unaccompanied by rigidity, was located at and above the umbilicus. This remote pain was also observed in the case of rupture of the spleen cited in the previous case. Brewer states that in the absence of spontaneous pain, localized tenderness with rigidity are strongly suggestive of visceral injury. Pain, moreover, may be present in injuries limited to the abdominal wall; muscular rigidity and tenderness, likewise, are not reliable, since they may be present in abdominal contusion alone. Progressive and increasing rigidity, if we have delayed too long for its development, is of moment. One symptom which has been of value is that of dullness which shifts with changes in position of the patient. With this symptom alone, laparotomy was done in one of my patients, other signs being lacking or indefinite. This sign,

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however, is not infallible, since the intestine, paralyzed by a severe crushing injury, will give a tympanitic note even in the presence of hemorrhage. Hiccoughing which might be expected in connection with ruptures of the diaphragm has not been present in any of the three patients observed. Other symptoms usually given as belonging to injuries of this kind are not early symptoms, but symptoms of peritonitis. If, therefore, we wait for a complete symptomatology we have waited too long. The symptomatology is, then, as I have briefly indicated, without definiteness, and the diagnosis is so often certain only by means of laparotomy which combines with its performance a certain means of recognition of the true lesion, and at the same time, an opportunity for appropriate and immediate treatment. Without further comment on the some time mooted question of exploratory laparotomy, the author would emphasize the statement that, laparotomy for exploration is as justifiable and scientific a procedure for the purpose of diagnosis as is the blood count or the employment of the aspirating needle. The trite mandate "when in doubt operate," has a most sound application in these cases, and the writer would therefore urge early laparotomy as a routine procedure in all cases of severe abdominal trauma where there exists any element of uncertainty.

The following case of rupture of the liver serves as an illustration of some of the foregoing points:

Case III.—George M., age 7, was admitted to Gouverneur Hospital late in the afternoon of July 20, 1904, having been injured by the passage of a truck over his abdomen. At the time it was stated that the truck had passed over his abdomen from right to left in a direction from below upwards, from the right inguinal region to the epigastrium. On admission his temperature was 99° and his pulse from 124 to 130, small and weak. The respirations were shallow and increased. The skin was cold, moist, and pale; the features were pinched and anxious. The boy complained of thirst, was restless and suffered from air hunger. Examination of urine and stools were negative. The abdomen was everywhere rigid, but there was no localized tenderness. There was shifting dulness in the flanks. The diagnosis of internal hemorrhage presented no special difficulty, but what viscus had been injured was difficult to say. The boy was seen about two hours after the injury and after a hasty preparation, under chloroform anæsthesia, an incision was made in the median line. Profuse hemorrhage had filled the abdominal cavity and incision of the peritonæum liberated large quantities of fluid blood and clots. The abdomen was flushed with large quantities of saline solution and a marked improvement of the pulse was noted. Further exploration revealed a tear in the visceral surface of the right lobe of the liver, nearly bisecting it. The gap was rapidly and tightly packed with strip gauze and the peritoneal cavity cleansed of

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the remaining blood and clots. The abdominal wound was closed with tier sutures, except for a small interval above, which allowed protrusion of the gauze. The boy was removed from the operating room in fair condition and with appropriate medication by the next day was progressing favorably. Improvement continued, and on the fourth day the temperature was normal. The pulse was still somewhat rapid, but of good quality. By a misunderstanding of orders the packing under chloroform anæsthesia was removed at the end of the fourth day. Following this procedure the child became restless and extremities were cold. Pulse was small and weak. Patient responded somewhat to external heat, though restless all night. Temperature on the fifth day was 102°, and on the sixth day 104°. Then by gradual decline at the end of sixteen days it was normal. On the fifteenth day repair was made of the abdominal wound, which had partially opened. For several weeks there issued from a small sinus at the upper angle of the wound a liberal amount of fluid which for the most part had the characteristics of bile. The subsequent history was uneventful. The boy made a slow but satisfactory recovery.

A few words concerning rupture of the liver may not be out of place at this time. Not many years ago, wounds of the liver were considered uniformly fatal and were left to an uncertain fate with the expectation that something might happen. The early statistics of Edler confront us with a mortality of eighty-five per cent. in complicated cases and of seventy-eight per cent. in uncomplicated cases. The more recent statistics of Douglas, of New York, who has collected forty-nine cases with a recovery of 47.8 per cent. in complicated and of 58.6 per cent. in uncomplicated cases bespeak a more hopeful attitude. The remarkable increase in recoveries has but one explanation, and that is that operations are now undertaken earlier, and that laparotomy is not done as a last resort, but as a first step in the treatment, or what amounts to the same thing, as a means to diagnosis when that diagnosis is uncertain.

The treatment of rupture of the liver in the main resolves itself into the treatment of the hemorrhage itself. Three methods for the control of liver hemorrhage invite our attention—the cautery, suture, and packing. The cautery is perhaps of some service when the smaller vessels are injured; in other words, where the convex surface is damaged and the wound is of easy access. The objection to the cautery is that by its use, more or less tissue is destroyed and this must separate before healing can take place. This necrosed tissue, besides, is a favorable nidus for the development of septic infection. Again, the cautery is unsafe, for when the necrotic mass separates there is great danger of secondary hemorrhage.

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Suture can be employed in superficial lacerations, but in deep wounds where close approximation is essential for repair, it would seem that it is of less value. The further objection that can be urged against its employment is that deep suture is difficult to accomplish besides consuming much time. In children the liver is particularly friable, and suture in all events can be of but little service.

Packing ought to be the method of choice if for no other reason than that it is most easily and readily applied. Tamponade properly applied leaves no fear of secondary hemorrhage. The only objection to packing that can be raised is the observation that with the withdrawal of the gauze, there is apt to be bleeding. This is no valid objection to the tamponade *per se,* since hemorrhage will only result when the gauze is removed too early. In any case where packing is employed, Nature immediately throws out ramifications of tissue in the meshes of the gauze and ensnares it more or less tightly. If, when the process is at its height, the gauze be forcibly removed, then hemorrhage certainly will result from the fact that the new formation has been forcibly torn asunder. However, if the gauze be left until the further process of liquefaction takes place, that is, when Nature has no further use for its services, the gauze will easily come away without unfavorable signs.

Conclusions.

1. The diagnosis of traumatic lesions of the abdomen is most difficult.

2. The signs and symptoms are variable in their exhibition and admit of no classification.

3. When there is an element of doubt in diagnosis laparotomy is indicated.

4. History and nature of injury may be the only indications for operation.

5. Early laparotomy will improve the percentage of recoveries.

6. Laparotomy as a means of diagnosis is without danger.

7. Tamponade is the best treatment for hemorrhage in ruptures of the liver.

To Dr. Erdmann, Dr. Kelly, and Dr. Ladinski of the visiting staff, I desire to express my thanks and appreciation for the privilege of operating on these cases and presenting them for publication.

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RUPTURE OF THE LIVER; OPERATION; DEATH.

By H. A. Haubold, M. D.,
Clinical Professor in Surgery, New York University and Bellevue Hospital Medical College; Visiting Surgeon, Harlem Hospital.

The importance of the location of the solution of continuity in cases of rupture of the liver, and the relationship which this bears to the probable outcome as regards the feasibility of surgical treatment, renders the case here reported of value. In a general way, it may be said that the location of the rupture usually corresponds to the site where the causative force was applied. It may also be said that, although the right lobe of the liver is the most protected portion, it is also the part most frequently ruptured. Waring, of London, in his rather comprehensive work on the "Surgery of the Liver," states that Mayer reported eighty-five cases of rupture of the liver, in fifty-four of which the lesion was in the right lobe, and that Ogston reported that in twenty-six cases the right lobe was ruptured in eleven.

The degree of force required to rupture the capsule of Glisson is considerable. This fact renders the coexistence of complicating injury to contiguous or more distant parts or organs exceedingly liable, and unless uncomplicated rupture of the gland is made the basis of an opinion as regards the mortality, conclusions from the statistics may lead to error.

My case was one of uncomplicated rupture of the liver, the lesion occurring in an exceedingly unfavorable portion of the organ as regards the application of methods of repair, and in consequence it had a fatal outcome. However, the case is submitted on the ground that no reasonable conclusion as to the utility of means of relief can be arrived at as the result of reporting only successes, and again, and more important perhaps, for the reason that the clinical picture presented by the patient was anything but classic as regards the symptoms which one had a right to expect when viewed from the viewpoint of the conditions confronting us upon celiotomy.

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M. K., a Hungarian, aged 29, was admitted to Harlem Hospital on June 30, 1907, at noon. The previous morning (twenty-four hours before) he had fallen a distance of about eight feet, striking the lower portion of his right chest on the edge of a pile of lumber. The injury caused him considerable pain, but he managed to reach his home, which was quite a distance from where the injury was received, without assistance. During the night he vomited the contents of the stomach, the pain in his side became more severe, and the day following his injury he was admitted to the hospital. On admission, a linear contusion, corresponding to the area of contact with the lumber pile, was discovered extending obliquely downward and backward, beginning over the anterior portion of the seventh rib and reaching to the tenth rib about on the level with the posterior axillary line, that is, directly over the right lobe of the liver. Temperature, 99° F. in rectum; pulse, 88. The abdomen was moderately distended; no broken ribs; some rigidity, most marked over the upper segment of the right rectus abdominalis muscle. The face was pinched, but there was no pallor, nor was thirst a marked symptom. In the night the patient vomited six times. Urine was voided, but the bowels did not move.

On July 1, about fifty hours after receipt of the injury, the patient came under my observation. At this time the pulse rate was 90, temperature 99° F., the face anxious, respiration 24, abdomen moderately distended and tender, the rigidity extending over entire abdomen. This certainly was not a picture of progressive hemorrhage. Indeed, the house surgeon thought the man's condition was rather better than when admitted. However, the anxious expression of the face, the distention and rigidity of the abdomen, together with the history of the character of injury received, the presence of the contusion, as stated above, and the fact that at the end of fifty hours there was still present the evidence of some abdominal lesion led to the belief that a rupture of the liver existed and justified celiotomy. An incision through the middle of the right rectus was made, extending from the costal cartilages to opposite the umbilicus. The abdomen was full of dark fluid blood. Exploration revealed an irregular rupture in the liver substance, situated low down in the right lobe, and so far posteriorly as to preclude repair by sewing or cautery, or indeed by any method which involved direct manipulation. The rupture was about three inches in length, and, by passing the hand down to it three fingers could be readily introduced for a considerable distance into the liver substance. There was still some oozing from the wound, but this was not so active as to cause immediate alarm. The cavity of the abdomen was freely flushed out with hot saline solution, a Mikulicz tampon was passed down to and into the wound, and slender ribbons of gauze were carefully packed into it. This seemed to control bleeding, and temporary approximation with through-and-through silkworm gut sutures was made. The patient came off the table in moderate shock; pulse, 98; respiration, 32. The tampon seemed to interfere with respiration to a considerable extent. At nine o'clock that evening the pulse had risen to 120, respiration 40, temperature 102° F.; at midnight, temperature 103° F., pulse 120. Eleven hours after the operation the patient died. At time of death the pulse was 120, respiration 45, temperature 105°.

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The case presented some unique features; there was at no time any evidence of shock, nor at any time the classic picture we generally regard as indicative of progressive internal hemorrhage. Neither the rate nor the character of the pulse indicated it; the temperature was at no time subnormal, there was no thirst, no restlessness, and no air hunger. It is of course to be borne in mind that the wound in the liver substance was at a location where there are not many large blood-vessels, both the portal and arterial circulation entering farther forward, and being distributed by means of smaller branches toward the periphery, and more so is this true in respect to the particular portion of the organ involved in the trauma in this instance. What we may believe happened is that the trauma which ruptured the liver was practically a blunt force which drove the ribs against the liver substance and ruptured it. The absence of the symptoms indicative of hemorrhage may be ascribed to the theory that the oozing was gradual and there was an accommodation of the body functions to the withdrawal of circulating fluid in this manner.

That death supervened so promptly after operative interference does not argue well for the technique employed, yet there was no other available under the circumstances. The persistent rise of temperature after the operation and up to the time of fatal outcome would argue strongly against the assumption that the bleeding had not been arrested by the measures employed. Hyperpyrexia toward the end of life is generally regarded as an exaggerated or disturbed metabolism. What connection there is between this phenomena and rupture of the liver is perhaps to be explained by the peculiar function the liver has as an internal secreting organ.

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ORIGINAL COMMUNICATION.

CASES OF PERFORATED DUODENAL ULCER.

By John J. McGrath, M. D.,
Visiting Surgeon, Harlem Hospital.

Without doubt chronic ulcer of first part of duodenum exists in many cases without its presenting symptoms sufficiently marked or characteristic to indicate the diagnosis until perforation has occurred or it may not be discovered until the autopsy is held. Vomiting and hematemesis do not mark the course of the disease, as in ulcer of the stomach, and often the patients complain only of indefinite symptoms of pain and discomfort in epigastric region some time after ingestion of food. Chemical examination would reveal the presence of blood in the stools.

The disease is not uncommon in young males—all the cases that the writer has seen, four in number, having been in men under 35 years of age. Cases I., II. and III. of this report were under 30. Diagnosis, when rupture occurs, is often mistaken for ruptured gangrenous appendix. (See Cases I. and II.) In the matter of treatment, the writer advises excision of the ulcerated area where possible and closure of the opening in a line transverse to the long axis of the duodenum with catgut, through-and-through sutures, reinforced by a Lembert suture of silk. Finally the abdominal cavity should be thoroughly flushed with saline solution and wiped dry with gauze pads.

Case I.—Michael F., age 23, laborer, Italy, admitted to Harlem Hospital about 10 a. m. March 7, 1905.

Previous History—During the past year has had occasional attacks of pain in the abdomen accompanied by vomiting.

Present History—Two weeks ago was taken with a severe pain in the abdomen and bowels somewhat constipated. After a while the pain became localized in the lower third of the abdomen. The pain became so severe yesterday that he had to take to bed. Bowels have not moved since three days ago. Patient complains of intense thirst and vomits continuously.

Examination—Patient is well built and well nourished; is very weak, unable to stand, and septic in appearance. Tongue dry, coated, and shows marked tremor. Pulse rapid and feeble. Abdomen tense, muscles con-

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tracted and board-like, more marked on right side. Tenderness general, but most severe in right iliac region. Liver: normal area of liver dulness is not present. Spleen: dulness absent.

Operation—Chloroform. Incision made in right iliac region, deepened down to peritoneum, which was opened between forceps. Immediately there escaped a large quantity of cloudy fluid containing flakes of fibrin. The intestines were covered with a slimy deposit. The appendix was brought up into the wound and found to be covered with a fibrinous deposit. The fluid continued to escape in large quantity, but had become distinctly bile-stained.

The incision was enlarged in an upward direction and further investigation revealed a perforation about 1 cm. in diameter in the anterior wall of the duodenum about 3 cm. away from the pylorus. The perforation had a "punched-out" appearance and was surrounded by an area of dense indurated tissue. The opening was closed with non-penetrating mattress sutures of silk and then an adjacent piece of omentum was sewn against the site of the sutured perforation. The abdomen was thoroughly flushed out with hot saline solution.

The abdominal incision was closed with through-and-through sutures of silk except for the upper end where a gauze drainage-plug emerged.

Subsequent History—Patient did not rally well from anæsthetic; pulse very weak and rapid. Wound is draining freely. March 8, patient died about 5 a. m.

Autopsy—Abdomen contained considerable quantity of sero-purulent material. Peritoneum injected and coated with fibrinous material. Numerous fresh adhesions present.

CASE II.—John B., age 28, marble polisher, United States; admitted to Harlem Hospital March 30, 1905.

Previous History—Had attack similar to the present about a year ago. This attack lasted a few hours only. Since then he has enjoyed good health except occasional attacks of dyspepsia—distress in abdomen after eating. Bowels are constipated.

Present History—About two and one-half hours ago, after working all day and feeling perfectly well, the patient ate some beans and sausage and drank a glass of beer. About half an hour thereafter he suddenly began to have severe epigastric pain, which rapidly increased and finally became especially marked over the appendicular region. The patient vomited during the past hour first food and then brownish fluid. Feels nauseated and retches continuously. Had one loose watery movement of the bowels this morning.

Examination—Patient is unable to walk on account of abdominal pain and weakness. Face pale; skin cold and moist; pulse rapid and feeble; abdomen flat, very rigid; right rectus especially stiff and board-like; very tender over lower part of abdomen with maximum point just below umbilicus; no tumor felt; liver dulness absent.

Operation—Chloroform. Incision made in right iliac region and deepened by "grid-iron" method down to peritoneum. This layer divided between forceps. Abdomen found to contain large quantity of bile-stained,

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chyme-like material. Appendix brought up into wound and found to be normal. It was replaced and the incision in abdomen closed. A second incision was thereupon made in the median line, about four inches in length and directly above the umbilicus. The stomach and abdomen were then explored and near the pylorus, upon the anterior wall of the duodenum, a small perforated ulcer was found. The opening was about 1 cm. in diameter with an indurated margin of about 2 cm. The whole indurated area was excised and the opening closed with several through-and-through catgut sutures, reinforced by a layer of Lembert sutures of silk. Abdominal cavity thoroughly flushed with hot saline solution. The incision in the abdomen was closed and the patient returned to the ward in a very weak condition.

Subsequent History—March 31: Patient has recovered fairly well from shock of the operation. Complains of intense thirst.

April 2: Cracked ice by mouth; general condition good.

April 4: Milk 3i at a time by mouth.

April 6: Wounds dressed; appendicular incision healed median incision shows several stitch abscesses; these opened; iodoform and dry gauze dressings applied.

April 16: Median incision healed.

April 20: Discharged cured.

CASE *III.*—Edward P., age 28; driver, United States; admitted to Harlem Hospital about 10.30 a. m. April 16, 1905.

Previous History—Habits good. Is a hard worker—drives an ice wagon and does much heavy lifting. During the past year the patient has had a severe cough often accompanied by expectoration of blood. Has never had an attack similar to the present.

Present History—For the past week has suffered from occasional attacks of abdominal pain, worse over appendicular region, and general feeling of weakness, but has nevertheless kept on working steadily. This morning while walking in the street was suddenly taken with very severe pain in the abdomen. There has been no vomiting until early this morning, when he vomited a quantity of bile-stained fluid. Bowels have been regular and moved once this morning.

Examination—Conscious. Well developed and fairly well nourished. Patient is very weak and pale; unable to stand on account of intense pain; lies with thighs flexed upon abdomen; skin cold, moist; mucous membranes pale; tongue dry, coated; marked tremor; pulse rapid, feeble and irregular. Abdomen full, rigid and board-like; entire abdomen tender, but tenderness most marked in upper right portion; hyper-tympanitic note; no mass made out. Liver: normal area of dulness lost; is tympanitic upon percussion.

Operation—Chloroform. Incision in median line reaching above and below umbilicus. A large quantity of chyme-like fluid found free in the peritoneal cavity. The appendix was sought and brought up into view. It was found normal and returned to the abdomen. The stomach and duodenum were examined and upon the upper anterior wall of the duodenum,

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close to the pylorus, was found a small, punched-out ulcer with indurated margin. The ulcer and adjacent indurated area were excised and the opening closed with several through-and-through sutures of catgut. A row of non-penetrating silk sutures were placed over the catgut sutures, burying the latter. The abdomen was thoroughly flushed out with hot saline solution and the abdominal incision closed with heavy silk sutures. The patient was returned to bed in fair condition and with pulse of much improved quality.

April 17: Patient has recovered from operation and is in fairly good condition. Is troubled with cough. Respirations rather frequent, about 40.

April 18: Abdomen not distended. Patient free from pain. Cough continuous. Respirations and pulse rapid. Temperature 102°.

April 20: Taking small quantities of milk by mouth. Bowels have moved. Cough with bloody expectoration. Dulness, crepitation and high-pitched breathing over both lungs below and behind.

April 21: Wound dressed. Primary union.

April 22: Temperature 105°; respirations 50. Died about 5 a. m.

Autopsy—Abdominal wound healed and abdominal cavity dry; wound in duodenum healed. Examination of lungs shows partial consolidation of both.

Case I: Probably perforated several days before admission to hospital. At time of operation general peritonitis was well advanced and the case was easily mistaken for ruptured gangrenous appendix. Operation in this case was a forlorn hope. Patient died from sepsis due to his secondary peritonitis.

Case II: Operated upon before the peritoneum had time to become septic. Particles of last meal were found in the abdomen. It was evident from symptoms that perforation had taken place in some part of the alimentary canal. Ruptured appendix was suspected, but incision over the appendix showed this organ to be normal and the character of the escaping fluid indicated the true nature of the accident.

Case III: In this case the diagnosis was made before operation. Note the suddenness of occurrence, while patient was walking upon street. He had been working right along apparently in good health so far as the abdominal organs were concerned. Subsequent history showed that the operation was successful as far as the duodenum was concerned. The patient died of pneumonia, due, probably, to anaesthesia and inspiration of infectious matter. He had evidently been suffering from a chronic bronchitis or possibly pulmonary tuberculosis for some time prior to rupture of his ulcer.

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THE INCISION AND TREATMENT OF THE STUMP IN APPENDICECTOMY.*

By Joseph B. Bissell, M. D.,
Visiting Surgeon, Bellevue Hospital.

So many different incisions for the operation of appendicectomy have been exploited by surgeons that one would almost be ready to conclude that all are more or less unsatisfactory. A proper opening in the abdominal wall through which to remove the diseased appendix is essential to a good result, and it can be safely asserted that we have such a method of approach. Most surgeons have their favorite incision or choose one at the time of operation, its site, length, and course depending upon the exigencies of the special case in question. A surgeon may make use of a particular form or place of opening in nearly every case, and the profession dignifies it quite properly with his name. Probably every English-speaking practitioner knows exactly what is meant by the McBurney or the Morris operations.

There are numbers of other operative procedures, named after the surgeons who first described or advocated them. A review of the literature of the subject suggests to one the time when every eminent obstetrician had a special forceps called after him. There are usually good surgical reasons why the advocate of each variety prefers his own method over all others, and, accepting these reasons in good faith, a short review of the technique of some of the best known operations would tend to the determination of some route into the peritoneal cavity, combining as nearly as may be all their advantages.

Such a conclusion, if it could be reached, would lead to a much to be desired simplicity in technique, and conserve the best interest of the patient. An ideal form of incision would be one which united all the advantages and avoided all the faults of the best of the various methods in use.

The incision in appendicectomy should be so carried out, while of sufficient size to accomplish its purpose, as to injure as

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little as possible the structure of the belly wall, the nerves, vessels, fascia, and muscles, and to avoid any tendency to hernia. Many of these operations leave the abdominal wall weakened and give the patient a predisposition to rupture. In certain cases this cannot be prevented, but in no interval operation need it occur. Painful scar and spreading belly wall, necessitating the wearing of a permanent belt, if they follow an interval operation, are also evidences of bad abdominal surgery.

In this case as in every other operation, we should work rapidly. Tait's golden rule was to get into, and out of, the abdominal cavity quickly; a rule which he never broke except to his discomfiture. His phenomenal success before the days of antiseptic surgery was due more to this one factor than to all others, brilliant as his results were. Recovery itself may depend upon speed. Rapid convalescence and clean healing are the sequences of quick operative work. The longer the operation and the more the hæmorrhage, the greater the shock, the more profound the depression, and the less the resisting power; hence the increased possibilities of infection.

From a working standpoint the following rules should guide us:

The incision should be so made that (1) the offending organ can be safely, easily, completely, and expeditiously removed; (2) the belly wall itself will receive the least possible damage; (3) the shock may be as slight as a capital operation will permit.

An incision which has the necessary advantages ought also to be one which allows for the possibility of disappointment in our expectations. The finding of pus instead of a simple subsiding or quiescent catarrhal inflammation may make drainage for a longer or shorter time obligatory.

The appendix can be reached anywhere in the right lower quadrant with a liberal incision. It is a safe conclusion that in most cases the long and extensive incisions formerly suggested are not desirable or necessary.

The choice of incision depends upon whether the appendicectomy is one of election or one of necessity, always bearing in mind that in this operation the unexpected not infrequently happens, and that it is well to choose a method, if possible, which will allow for drainage in case suppuration or gangrene is found, even when not anticipated.

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Three classes of cases then will influence our decision:

1. The interval operation, so-called, the interval being hypothetical, of course, as there can be no interval between two attacks if the second attack cannot take place, the appendix having been in the meantime removed.

2. The late operation; one performed after the formation of an abscess, or when there is present a spreading peritonitis.

3. The immediate operation; when in an acute inflammatory condition the question of operation is most complicated, but is apparently imperative.

In the second case there is no choice. An abscess with well-defined adhesions, without regard to other considerations, must be opened widely at the lowest point in the quadrant, where it is most prominent and where drainage is easiest. The operation over the site of the abscess does not make any effort to preserve anatomical structures or to avoid injury to tissues. It is the operation of necessity.

If a spreading peritonitis is made out or strongly suspected, the median opening offers the best chances. The median operation only is to be used in these cases. It is too far from the appendix to reach and remove it easily, without a longer cut than is advisable. It is used otherwise when the removal of the appendix is incidental to some other operation, as in that for ovarian or other pelvic disease. In the male the abdominal walls are too rigid and thick to permit easy access to the appendix by this route. Its advantages are that no nerves or large vessels are cut, and that by it the abdomen can be rapidly and easily opened and closed.

The Fowler incision is obliquely parallel to Poupart's ligament, the middle of which intersects at right angles a line from the right anterior superior spine to the umbilicus. It divides all the structures to and through the peritoneum; it is two and a half to 3 and a half inches long; it gives easy access to the appendix but is very liable to be followed by hernia. It is probably the best known and most popular incision.

The French method, introduced by Roux in 1897, is similar with no particular advantage, excepting that the peritoneum is opened in the upper part of the wound at first for diagnosis, the opening being thereafter enlarged if necessary. Sonnenburg's incision is made along Poupart's ligament through all the belly

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wall structures. It opens close down upon the ileum, often cuts the epigastric artery, and always cuts a large branch of the circumflex and a large vein. It is said to afford the best drainage.

Morris's incision is the shortest (one to one and a half inches long over the site of the appendix); it is oblique, terminating internally at the edge of the rectus muscle. The muscles and fascia are bluntly dissected; the transversalis fascia and peritoneum are hooked up together and divided by the scissors, which is the only cutting instrument used in the operation after the skin is incised. One catgut suture usually closes the peritoneum, transversalis fascia, and internal oblique aponeurosis. The external oblique with its own aponeurosis is united by means of one or two interrupted sutures. The fat is kept out of the way of the skin sutures, only one or, at most, three of which are used. This procedure means rapid union, a quick convalescence and a very slight scar, or no scar at all. This incision encounters no vessels of importance and does little or no damage to nerves. It does not provide for unexpected conditions.

McBurney's well-known method needs no description here. It leaves the abdominal wall nearly as strong as before operation, leaves no painful scar, and there is little trouble from cut vessels. It takes a considerable amount of time, and is very unsatisfactory if the conditions necessitate drainage.

Mayo modifies the operation, when drainage is called for, by adding a posterior opening for the drain and closing the wound in the abdomen tightly. This increases the time required, and in most of the cases it is found that the anterior wound becomes infected as well, so that nothing is gained but through-and-through drainage.

The Deaver incision directly through the rectus has the advantage of rapidity. Besides the trauma to the muscle this incision would appear to leave a possible weak point in the belly wall.

Howard Kelly, to whose book on the appendix I am under obligations, prefers to make two incisions when the diagnosis is uncertain. One in the semilunar line to locate the tumor, with the hand in the belly for guidance, then a second incision over the mass or laterally to it, closing the first incision before making the second. Kelly, however, uses the McBurney incision when no pus is present, *i. e.*, for most interval cases, and the semilunar incision, to be described next, when an abscess

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is to be evacuated, and when there is necessity for extensive packing with gauze.

There are numerous other methods of more or less value. Not taking into account any operation which is done primarily with another object, the appendicectomy being merely incidental, as, for instance, that of Edebohls, who extends the lumbar cut made for a suspension of the kidney, around into relation with the peritoneum in front and opens the cavity to the outer side of the colon.

The semilunar incision has been advocated and adopted with some modifications by several surgeons of ability and is known also by their names. Originally Krogius of Berlin described, in 1889, a vertical incision, which he called the Schüller incision. This was employed by Sands and Morton and other American surgeons twenty years ago. A modification of this incision was described by Battle in 1895, but had been practised by an American surgeon, Kammerer, before that time, and was advocated by him in the *Annals of Surgery* in 1897. It is a vertical incision about two and a half to three inches long, over the right semilunaris. The middle of it is over the appendix, the incision is first through the skin and fat down to the aponeurosis covering the rectus, which is opened the length of the skin incision, but a finger's breadth nearer to the median line. The rectus muscle is retracted toward the left and the posterior sheath and peritoneum are cut through together, avoiding the deep epigastric vessels which are always seen. The wound when closed is in three layers of sutures not in line with one another. The rectus muscle lies between the posterior lines of sutures and thus secures a firm belly wall. If the adipose tissue of the belly wall is well developed buried sutures bring it comfortably taut. A subcuticular suture closes the wound. All ligatures and sutures are of absorbable material. The drain, if indicated, is placed at the bottom of the wound. Firm union results after its removal.

This incision has the following advantages: Through the wound the appendix is easily accessible. The other pelvic organs can be readily and quickly examined. The incision injures no nerves or vessels. It is of adequate, but not undue length. It admits of proper drainage without interfering with the ultimate result. The danger of hernia is avoided. The operation does not take a perceptibly longer time than any other short operation, hence, there is a minimum amount of shock. Convalescence

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is short. There is a small linear scar or none at all. It fulfills better than any other operation the rules laid down by Moynihan for abdominal incisions, viz., "To obtain clean and perfect healing and permanent strength in the wound it is necessary to have (*a*) clean, neat incisions; (*b*) an absence of teasing or fraying of the muscle edges; (*c*) protection of the lips of the wound from damage by instruments, hands, or discharges; (*d*) perfect asepsis throughout; (*e*) accurate suturing in layers, sutures of apposition and sutures of support both being used; (*f*) an absence of tension in the wound." All of these requisites are present in this operation. In over 150 cases of the writer, operated upon in the above described manner, some of them dating back to 1898, there had been no hernia.

The treatment of the stump is a most important detail. The proper removal of the appendix is essential to the rapid recovery of the patient. Freedom from pain and from other resulting intra-abdominal complications as well as from infective peritonitis depend upon the care with which this is performed. The procedure has developed a great variety of methods. It would take much less time to name those surgeons of well-known skill who have not developed a particular method of treatment of the appendical stump than to name those who have.

The indications are so simple and the results following the careful carrying out of these indications so certain and satisfactory that it seems a pity that there should not be one method instead of thirty or forty in general use. I am speaking, of course, of the typical interval case where there are no, or few, and easily relieved adhesions and where the appendix is not abnormal in shape, size, condition, or position to any very marked extent. Variations can be made in the method about to be described to meet almost any of these contingencies.

The first indication is speed. The second is to do little damage to the tissues about the appendix. The third is to remove or destroy all infectious material. The fourth is to leave behind no foreign body, or material acting as such.

The first is a general rule and is to be applied to the operation as a whole as well as to the detail under consideration. A rapid and certain method of treatment will shorten the time required and thus favorably influence the fate of the patient. Inversion of the stump or the whole of the appendix takes time, and often a good deal of time; it violates the second indication by increasing the necessary trauma to the neighboring tissues.

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As has been ably demonstrated repeatedly, the stump is often inverted only into the wall of the cecum, not into its cavity. In this situation it acts like a foreign body and interferes with the local blood and nerve supply, causing symptoms which long afterward may be troublesome and misleading. Persistent pain is one of the results often following this method of treatment. The bad position of the stump constricts and presses upon the anatomical structures so that they easily become a good culture medium for whatever bacteria may be present. I have no doubt that this condition is a most frequent cause of localized infection and fecal fistula. No time should be lost in intricate and tedious sewing of flaps or collars over the amputated stump, neither should an extra series of sutures or ligatures or scarifications be employed. They are unnecessary and take up time. Temporary followed by permanent ligatures have the same objection.

The third indication is certainly not fulfilled if any part of the infected mucous coat is left behind undestroyed. Pure carbolic acid is efficient only to the depth in those tissues to which it readily reaches. In certain cases this may be sufficient. Thorough destruction of all the mucous membrane left behind is the only certain security, and this can be accomplished readily and quickly by the actual cautery.

All non-absorbable suture materials left behind are foreign bodies and act very offensively as such at times. Absorbable sutures act in a like manner until absorption occurs, therefore those sutures and ligatures which remain only just long enough to accomplish the purpose of their insertion are better than those which remain for a longer time than is absolutely necessary. Twenty-four to forty-eight hours is the time usually given for peritoneal adhesions to form fairly firmly. A properly prepared three-day No. 1 catgut is sufficient for ligatures to the stump and the appendix as a rule.

The following method fulfills all the indications as called for above and avoids as nearly as may be, the usual faults in the technique:

The mesoappendix is tied off by one thread of a double ligature passed close to the base by means of an aneurysm needle, and the other thread of this ligature is tied around the appendix close to the cecal wall; a narrow artery forceps grasps the appendix a quarter of an inch away from this last ligature. After surrounding the cecum and protecting the peritoneum in the usual

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manner with gauze tapes wrung out dry with saline solution, the appendix is burned through rapidly with a red-hot cautery tip, burning out thoroughly the mucous membrane of the stump. The free ends of the ligatures, of which there are two, one for the stump and one for the mesoappendix, are cut off close, unless it is intended to drain. If the wound needs drainage the tips from the ligature around the stump are left long to tie the drain down to later.

The nearest piece of mesentery available is laid across the stump and pedicle. It is not necessary to secure it in place by sutures. If the neighboring serous membrane, mesentery, omentum, or small gut is allowed to fall into place by its own weight, in a few hours, almost before the patient has recovered from the anæsthetic, adhesions form and the site of operation is sealed over by nature in the most secure manner. If drainage is to be instituted, a cigarette drain made of a narrow strip of gauze inside a split rubber tube is attached to the base of the appendix by means of the ligature ends which have been left long for this purpose; one of them is threaded into a needle and by this the catgut is carried through one end of the drain, which is tied down to the appendix stump and the free end brought out of the lower part of the wound. The ligature tie is cut off close to the stump and the wound closed in the way described above. At the end of from 48 to 72 hours a little jerk of the drain pulls it off from the disintegrated catgut. The drainage by this time has done its work and the sinus is treated in the usual manner until it fills up. During the operation no washing is done to, nor are solutions used in, the wound or in the abdominal cavity. A very little gentle wiping away of any purulent foci or surfaces is allowed. As little violence as possible is to be done to the peritoneal surfaces. A colleague and myself at St. Vincent's and Bellevue hospitals have treated our appendical stumps after this method for the last seven years, to the complete satisfaction of both patient and surgeon.

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UNILATERAL RENAL HEMATURIA DUE TO PYELITIS CYSTICA.*

By Irving S. Haynes, M. D.,
Visiting Surgeon, the Harlem Hospital.

Unilateral renal hematuria may be due to many causes—as calculus, tuberculosis, new growths, etc.,—which are demonstrable before or at an operation, less often to some obscure condition not ascertained even during an operation and, in a few instances, the cause has not been found after the extirpated kidney has been subjected to careful microscopical examination.

Such instances of bleeding from apparently normal kidneys have been termed idiopathic or essential hematuria. These cases, however, on microscopical examination usually show some pathological condition sufficient to explain the hemorrhage. The lesions most frequently present in this class of cases is one of isolated patches of chronic nephritis.

But in the absence of microscopic changes it is not safe to attribute to this cause all such cases of obscure bleeding. The following case which I wish to report furnishes some pathological changes not usually found in the so-called instances of " essential hematuria."

History of patient taken March 7, 1905:

J. W., age 65; American; retired builder. Large strong man, apparently about 50 years of age, weighs 185 pounds. Has never used alcoholic beverages, smokes a little.

Family History—Father died at 78, mother at 32 in childbirth. No "bleeders" or cases of Bright's disease, cancers, tumors, or "stones" in the bladder in family.

Previous History—Forty-four years ago he had an attack of malaria and jaundice while with the army at Nashville, Tenn. He was very yellow at this time, but had no attacks of pain. His skin did not clear up entirely for two years, and the effects of this attack lasted for several years. There were no symptoms, however, referable to the genito-urinary system.

Twenty years ago he had an attack of rheumatic sciatica. His general health has been excellent. He never has had any venereal diseases, in fact

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never had sexual intercourse until his marriage, when fifty years of age, to a strong healthy woman half his age. He has been very vigorous in his marital relations, and has three healthy children.

Present History: Urination—In 1897 he began to notice that he had to pass his urine more frequently than usual. These attacks of increased frequency of urination at first lasted only a few hours, and would then pass off. They would return under stress of extra exertion, worry in business, excitement and loss of sleep. He began to get up to urinate during the night. Gradually the act of urination became painful, the pain seeming to run from the kidneys and the head of the penis to centre in the bladder. At present he urinates every hour or two if at rest, and not excited or worried, but every five to ten minutes if under mental strain.

At night he gets up from six to eight times, sometimes more. When under any nervous tension, he has a great deal of straining during urination with severe pain in the head of the penis. Cold sweat runs down his back. The urine comes in a gush in a good sized stream. He says it has never stopped suddenly.

Pain—He feels at times pain in the small of the back—"like boring with an auger"—more on the left side, but it may extend over to the right side. The pain goes away on lying down. The pain shoots down into his scrotum and to the head of the penis, especially just before urinating, and is so severe that he has to squeeze his penis as hard as he can to ease it.

Blood in the Urine—In the summer of 1903, after being forced to hold his water for a long time, he first passed bloody urine. This attack lasted twenty-four hours, when the urine cleared up after resting at home. Twice since then he has noticed two or three "strings of blood the size of a pin and one-half inch long" in the urine. Last summer, 1904, there was a small blood clot in the chamber. Bowels are quite regular. His digestion is slow. Tongue is slightly coated at times. He has some soreness beneath the costal arch on the right side at times.

Physical Examination—Temperature, normal; pulse, 84; arteries, soft. The heart and lungs are normal. The liver is not enlarged. There is no trouble with the gall bladder or ducts. The stomach is normal. The spleen is not enlarged. The intestines are not distended, nor sensitive, and there is no evidence of appendicitis. Neither kidney is sensitive or palpable. There is no tenderness over the course of the ureters, nor over the bladder. The external genital organs are normal. There is no stricture in the urethra. Residual urine measures one ounce; it is a little cloudy, but not bloody or ammoniacal. Specific gravity above normal. Trace of albumen.

Rectal Examination—This shows only a good-sized prostate normal in feel and not tender.

In one month under urotropin, alternating with a mixture of hyoscyamus and infusion of buchu, the urine became clear, there was no residual urine left in the bladder, and his general condition improved so much that he did not report for several months, or until January, 1906, when he stated then that during August, 1905, one morning, after passing a quantity of clear urine, there followed about an ounce of bright blood. After this

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he passed bloody urine for a few days. An urinalysis made February 7, 1906, shows the following:

Odor, urinous; color, yellow; spec. gravity, 1.025; reaction, moderately acid; appearance, cloudy; sediment, small amount; quantity passed in twenty-four hours, fifty-two ounces.

Chemical Analysis—Albumen, large amount; sugar, small amount; urea, 9 gr. per oz.; bile, none; aceton, none; indican, none; chlorides, normal; phosphates, normal.

Microscopical Examination—Epithelium, few, round; crystals, none; amorphous deposits, none; blood, *large number corpuscles;* pus, large number leucocytes; casts, *hyaline;* mucus, large number corpuscles; fungi, none; spermatozoa, none; bacteria, none.

The irritation in the penis and soreness over the back is less, and his general health is better than one year ago.

I had several x-ray photographs made by Dr. L. G. Cole, of which the outlines are here given: Fig. 1, the right kidney; Fig. 2, the left kidney; Fig. 3, the pelvic cavity. All viewed from behind.

The photograph of the left kidney shows that it is considerably enlarged. In the pelvis (photograph No. 3), in a region apparently close to the bladder, and in the course of the left ureter is a small dark round shadow. A tentative diagnosis of ureteral calculus was then apparently justified.

On March 9, 1906, Dr. Follen Cabot cystoscoped the patient for me, methylene blue having been previously given. Examination of the bladder showed that it was normal in all parts except about the left ureteral orifice. Here the mucous membrane was somewhat thickened and reddened.

A catheter was readily entered in the right ureter and passed to the pelvis. The orifice of the left ureter was entered after some difficulty owing to a ridge in front of it, and the catheter passed easily and without obstruction to the pelvis of the kidney. This demonstrated that there was no calculus in the ureter. The shadow in the photograph might have been cast by a calcareous lymphatic gland, a phlebolith, or some object in the rectum.

Examination of the urine from the left kidney was made by Dr. T. W. Hastings, who reported as follows:

Urine, blue, after methylene blue, faintly cloudy, few fine flakes. Albumen, a trace.

Microscopic: Many large cells, single and in masses; few leucocytes; many blood cells; few squamous cells from genito-urinary tract. Stained after hardening. *Cells in masses show structure, suggesting neoplasm, particularly papillomatous tissue.*

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At this date, as the patient was indisposed to have any operative work done—as the evidences of a papillomatous growth in the kidney was very inconclusive, as his general health was good and his urinary symptoms not urgent, and he was enjoying a fair degree of comfort from internal medication, I did not urge operative treatment. He reported once or twice a month for observation.

On November 5, 1906, an urinary analysis by Dr. Hastings is as follows:

Appearance, cloudy; color, normal; reaction, acid; acidity, normal; specific gravity, 1015; urea, 2.5 per cent.; indican, increased; albumin, trace, marked; glucose, none; diazo, none.

Sediment: Amorphous, none; crystals, none; epithelium, large and small round cells numerous; casts, none; red blood cells, numerous; leucocytes, numerous.

Remarks: Tissue cells not found. Tubercle bacilli not found.

April 5, 1907: The patient reported to-day. He has lost twenty-five pounds in weight, but has been fairly comfortable until within the past two months. Since then he has frequently passed bloody urine, not in large amounts, but more often, so that for the urine to be clear is the exception. The pain in his left flank has been more constant. It is located just to the left of the lumbar spine, though there is no tenderness on pressure here or elsewhere in the abdomen.

The desire to urinate has increased in frequency and become more imperative. Unless he attends to the call at once, he often urinates in his clothes.

The medicinal treatment seems to have lost its effect. He was so wearied with his present condition that he wished something done.

April 9, 1907: Dr. Follen Cabot made a second careful examination of the bladder. About the left ureteral opening and reaching to the middle line, the mucous membrane was inflamed and swollen, and the vessels injected, and the area red and angry looking. There were no growths; the prostate was not pathologically enlarged.

Urinary examination from the bladder by Dr. Hastings shows:

Examination of Whole Urine—Date, April 10, 1907: Appearance, faintly cloudy; color, normal; reaction, acid; acidity, normal; specific gravity, 1012; urea, 1.76 per cent.; indican, none.

Sediments: Amorphous, none; crystals, calcium oxalate; epithelium, few squamous cells; casts, none; albumin, trace; glucose, none; red blood cells, numerous; leucocytes, numerous.

Remarks: Albumin present, red cells and leucocytes numerous, no fixed-tissue cells found.

From the right kidney by ureteral catheter: Albumin, none. Sediment: Amorphous, none; crystals, none; epithelium, few squamous cells; casts, none; red blood cells, none; leucocytes, none.

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Remarks: Specimen by catheterization of ureter normal microscopically.

From the left kidney by ureteral catheter, April 14, 1906: Appearance, cloudy; color, pale yellow; reaction, acid; acidity, normal; specific gravity, 1016; urea, 1.9 per cent.; indican, trace, normal; albumin, trace.

Sediment: Amorphous, none; crystals, none; epithelium, few squamous cells; casts, none; red blood cells, moderate number; glucose, none; leucocytes, numerous.

Remarks: Single epithelial cells, large and small, no cells suggesting new growth as in former specimen.

The diagnosis was in doubt. Whatever the lesion, it was located in the left kidney.

Calculus could be ruled out from the character of the hemorrhages, the absence of renal colics, the negative x-ray findings. Tuberculosis was not probable as no tubercle bacilli had been found in repeated urinary examinations; the absence of foci elsewhere, and the general good health of the patient. Malignant growth could be excluded as no tumor could be felt and the long duration of the disease without cachexia made its existence seem very improbable.

The only positive evidence we had to depend upon was the presence of the posterior kidney pain, the irregular and intermittent hemorrhages and the finding with the microscope of "cells ni masses (which) show structure suggesting neoplasm, particularly papillomatous tissue," which Dr. Hastings had noted a year previously. The most reasonable conclusion was then that there was some benign pathological process in the pelvis of the left kidney, probably a villous papilloma. Operation was undertaken April 13, with the assistance of Drs. Fletcher and Boynton. An external perineal section was first done, chiefly to drain the bladder, secondarily to deplete the prostate. A skirted cannula was inserted into the bladder and the wound packed.

Next the left kidney was exposed through a six-inch oblique incision, the twelfth rib requiring section.

The perirenal fat was excessive and in many places was adherent to the kidney capsule. It was stripped off and the kidney delivered through the incision without undue tension on its vessels.

It was large and presented the characteristic fœtal lobulated appearance in a marked degree, but otherwise seemed normal. Nothing was seen or felt from the exterior.

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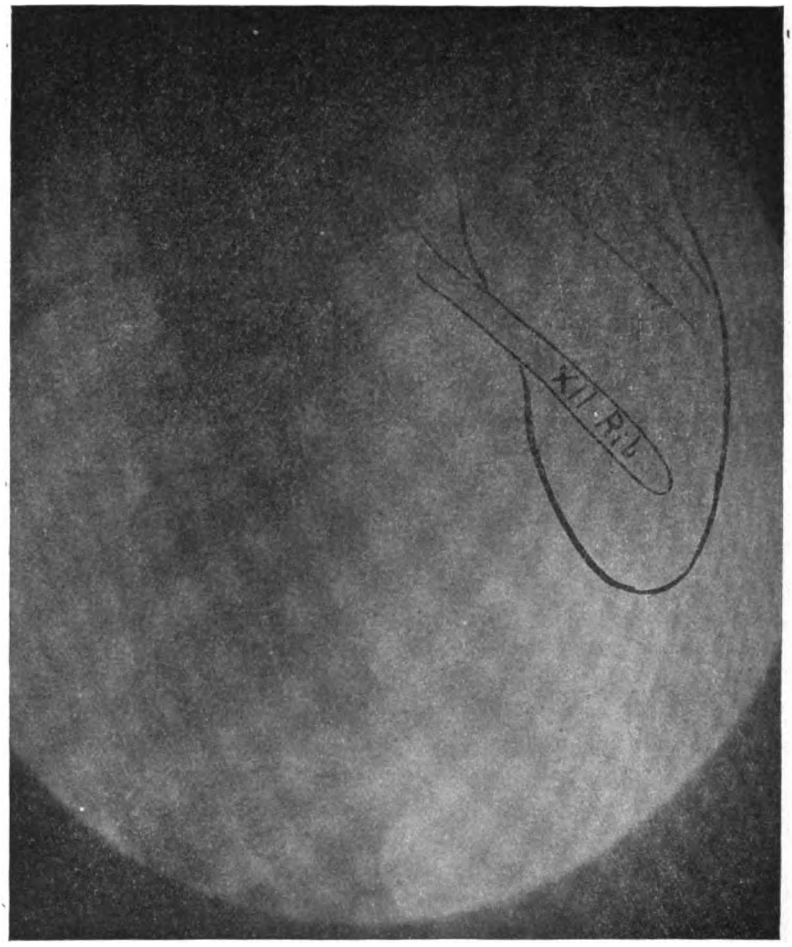

FIG. 1.—Right kidney. From behind.

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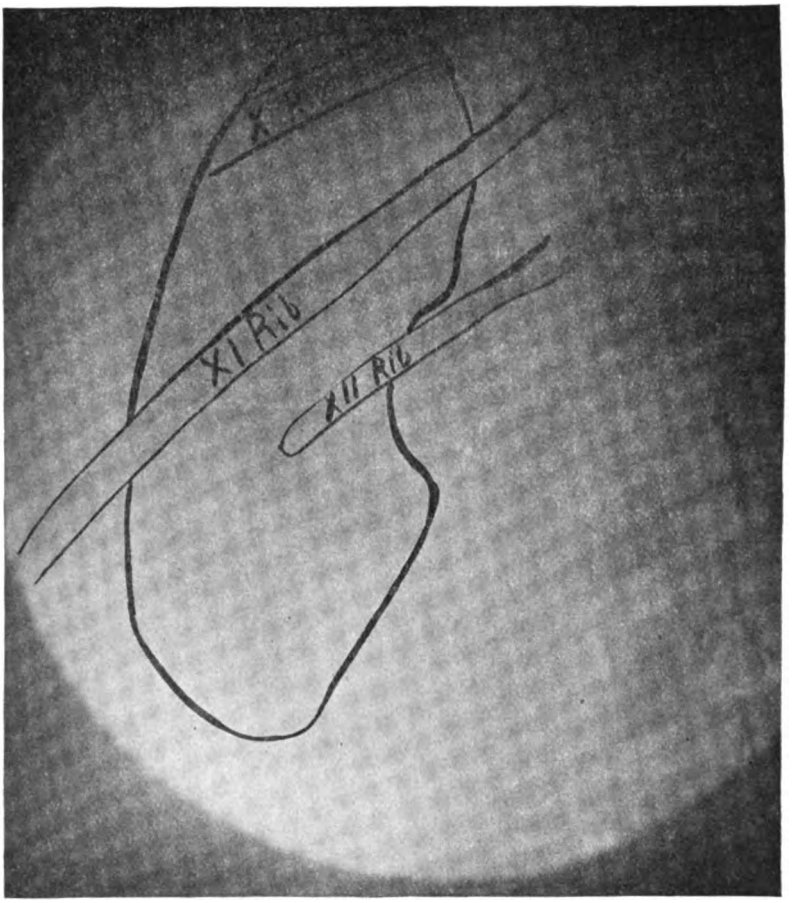

FIG. 2.—Left kidney. From behind.

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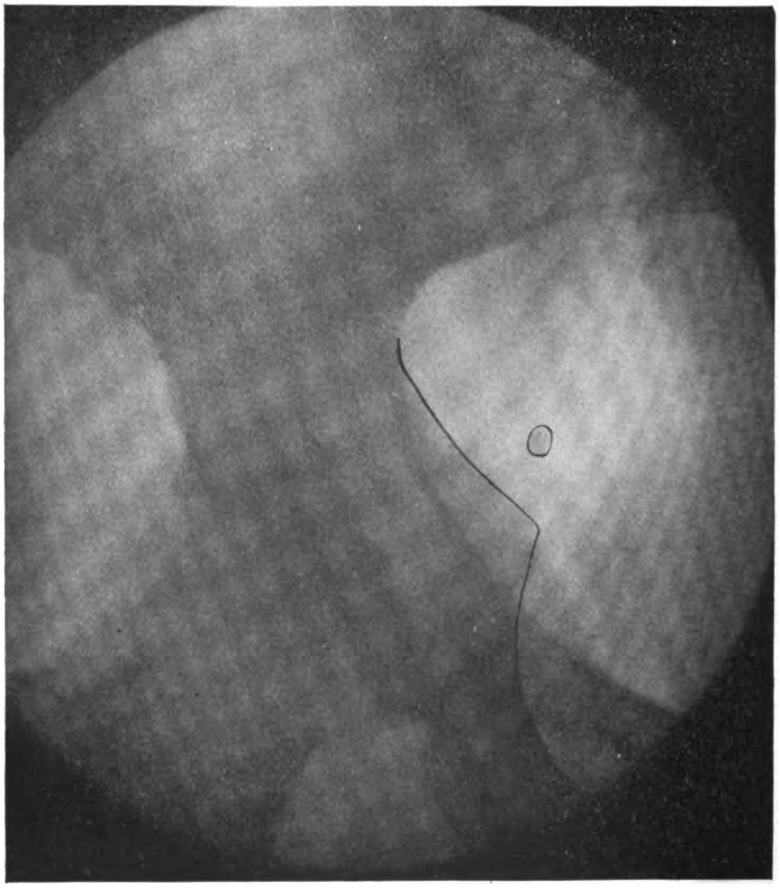

FIG. 3. Left side of pelvic cavity. From behind.

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The cortex was then split to the hilum, and a digital examination found nothing. The question what to do next I solved by removing the kidney, for it was clearly the seat of some irritation that produced the hematuria. The cure of this condition in our ignorance of the cause of the hematuria without a nephrectomy was problematical, the operation was being performed for the sole purpose of relieving our patient, and we knew the right kidney was working normally.

The removal of the kidney was accomplished without especial difficulty, though there were two large arteries—one to each pole besides the normal renal vessels. These, the other vessels and the ureter, were ligated separately.

The muscles were sutured with No. 3, forty-day, chromic gut, and the skin with No. 2, ten-day, chromic gut continuous sutures about a small cigarette drain.

What started out to be a smooth convalescence was interrupted on the third day by the unfortunate breaking of the muscular suture followed by free oozing from the wound and severe shock to the patient. With the assistance of Drs. Connors and Moorhead, the wound was reopened and masses of blood clots scooped out. No bleeding points were visible, but there was a slight oozing from the entire surface of the perirenal fat.

The region was packed moderately with iodoform gauze, the muscles closed with interrupted No. 3 chromic gut sutures, and the skin with a No. 2 continuous suture up to the gauze wick.

The case progressed so far as the wounds were concerned satisfactorily, and the gauze was gradually removed in the course of the week.

In a month the patient left the sanatorium with a small perineal and lumbar sinus. A report of the urine, one week after the first operation, shows that there was forty-eight ounces passed in the twenty-four hours without kidney elements, and containing fifteen grains of urea per ounce.

The strain of the second operation upset the patient's mind for ten days, so that, while usually rational by day, at night he was quite delirious and unable to sleep.

After trying various sedative hypnotics with hardly any effect, I finally stopped them all, gave the patient a pint of beer every night, and he quieted down, slept well and began to gain.

The Examination of the Kidney—Macroscopically it was enlarged, deeply lobulated, but presented no naked-eye evidences of

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disease in the kidney tissue proper or in the pelvis. I concluded I had removed a normal organ. However, after hardening the specimen in a 2 per cent. solution of formaline, I examined the kidney again and was surprised to find that the mucous membrane over the entire pelvis of the kidney showed a very fine villous surface with small dark spots here and there.

Microscopical Examination of Kidney—Case of Renal Hematuria.

By Dr. James Ewing.

"The organ shows a moderate grade of chronic productive nephritis, with thickening of the stroma in many *patches,* and general arteritis. *The tubules and cells are practically normal.* The whole organ is in a state of chronic venous congestion, as shown by the dilatation of large veins and distention of glomerular capsules. *The pelvis shows the lesions of long standing pyelitis.* The epithelium is disordered, in places thickened, at other points thinned. The basement membrane is irregular and often deficient, the epithelium lying upon a layer of dense hyaline connective tissue. At many points the epithelium has become invaginated into the subjacent tissue, yielding islands of isolated epithelium similar to those seen in early stages of *pyelitis cystica.* At some points the new connective tissue shows many new arterioles, but it is usually non-vascular. Numerous extravasations of blood are to be found beneath the pelvic epithelium, in the fat tissue, and in and about the dense connective tissue supporting the epithelium. No dilated veins are seen in the pelvic mucosa. Two possible sources of hemorrhage are to be found in this case:

"1. The chronic venous congestion of the whole kidney.

"2. The superficial chronic inflammation of the pelvic mucosa, which has produced many new but poorly formed vessels.

"The exact points of origin of the hemorrhage were not discovered."

Subsequent History—November, 1907: His general health is good. The perineal incision healed in the course of two months. A lumbar sinus exists three inches deep. It discharges a little muco-pus in the course of two or three days sufficient to stain through four layers of gauze. Blood, in a very slight amount, has appeared in the urine first passed after the use of sounds (No. 18 English) on two occasions, but there has been no return of the old condition. He still has a contracted bladder and chronic cystitis with frequent micturition for which he is under treatment at present. But there is no residual urine.

He has no pain unless he attempts to hold his urine too long. This is more of a "sore feeling" in the bladder and penis.

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The prostate is not enlarged (the left lobe is somewhat smaller than the right), it is not tender to pressure, the urine examination by Dr. Ewing is as follows:

November 6: Appearance, cloudy; faint yellow; reaction, slight alkaline; specific gravity, 1015; albumin, slight nucleo-albumin—small amount serum albumin.

Sediment: Moderate; crystals, none; epithelium, many flat; casts, none; red blood cells, good many; leucocytes, many.

Remarks: Appears to be urine of chronic cystitis, many bacteria present, very little mucus, leucocytes in clumps, epithelia hydropic.

How may the course of events in this case be explained?

First: The man marries late in life and is very active sexually at the same time "withdrawing" to prevent conception. This leads to a chronically congested condition of his whole genito-urinary system, particularly his prostate and bladder, marked by frequent and painful micturition.

Second: There was an occasion of forced retention of urine followed by a free bleeding for a short time. This might mean that the lesion causing the hematuria was in the bladder or in the left kidney. If in the latter the urine might have damned back into its pelvis and the lesion been located there.

Third: Wherever the lesion was situated it doubtless furnished the atrium for an infection which has since persisted. In the kidney it was sufficient to cause an obstinate hematuria, and in the bladder it still requires active treatment.

It is idle to speculate whether the condition was primary in the kidney or bladder. However, in view of the fact that the right kidney was not affected; that the infection if extending from the bladder would be likely to involve both kidneys and that the second cystoscopic examination showed a decidedly more extensive and active cystitis about the left ureteral orifice, than had existed at the first examination one year before, I am disposed to think that the "infectious" process began in the left kidney and extended to the bladder, although the latter was in a state of chronic congestion before this occurred.

Fourth: The infection in the left kidney eventually developed into a chronic pyelitis as shown by the presence of pus and blood

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cells (microscopic examination). The final condition has already been described by Dr. Ewing, and he calls the lesion a "pyelitis cystica," *i. e.*, similar to the pathological changes found in cases of chronic cystitis.

Fifth: The changes in the stroma of the kidney (its essential structure not being involved) were probably brought about as a result of chronic congestion of the organ caused by obstruction to the outflow of urine from the kidney, and to the inflammation of the mucous membrane of the pelvis of the kidney and bladder (about ureteral orifice).

The changes in this kidney seem to be quite different from those mentioned as present in kidneys apparently normal that were removed for persistent hemorrhage. In those cases the usual histological findings have been scattered areas of chronic nephritis involving the tubules or glomeruli.

In only two instances in the reported cases which I have read do I find the hemorrhage apparently caused by pathological changes in the mucous membrane of the pelvis of the kidney.

One is reported by Myles:

A woman, 26 years of age, from whom the left kidney was removed after an antecedent nephrotomy had been performed without relief of the hematuria. On histological examination diffuse myxangiomatous change was found in the submucous tissue of the pelvis of the kidney, while the tissues of the kidney were the seat of but slight changes.

The mucous membrane of the pelvis was probably in a state of so-called pyelitis cystica.

The other is by Keefe:

A farmer, 38 years of age, not a bleeder, whose history dated back six years, when after a cold he had frequent and painful micturition with hematuria. The attack lasted two months. Three years later he again noticed blood in his urine as small streaks. The bleeding increased in amount to the present time. The blood is bright at times, at others clotted. He lost thirty-five pounds during the last year.

The urine is red; specific gravity 1029: Alkaline: Large quantity of blood found by microscope. The cystoscope showed the left ureteral orifice red, swollen and pouting. The rest of the bladder was normal. A specimen obtained from the left ureter by catheter showed numerous blood cells, but no casts. The x-ray was negative. There was a dull aching pain over the region of the left kidney.

The kidney was exposed, palpated, incised and probed; nothing was found. Although it appeared normal it was removed.

Microscopical examination of the kidney showed only several small reddish injected areas in the pelvis. By the microscope some extravasation of blood into the substance of the kidney beneath the cortex was

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found. The cause of this condition was not evident. In sections of the pelvis a few areas of extravasated blood into the tissues were found. The patient recovered and six months after the operation was apparently perfectly well. The clinical history of this patient is strikingly like the one I have reported, while the gross pathological findings parallel it closely. The histological report is not full enough to warrant any conclusion, although, here also the two specimens seem considerably alike. Evidently there is not much doubt but that the pelvis was the seat of the hemorrhages.

"Idiopathic Renal Hematuria."

A brief review of the essential features of this obscure form of renal bleeding may not be out of place:

Synonyms—Under the general terms of idiopathic renal hematuria may be grouped all those cases formerly classified as essential, hemophilic, angio-neurotic, hysterical and neuralgic renal hematuria, and renal hemorrhage without lesions.

With the exception of angio-neurotic hematuria and renal hemophilia this classification of hematuria without gross lesion in apparently healthy kidneys has become practically obsolete since such kidneys have been subjected to careful microscopical examination.

Etiology—As mentioned before these kidneys under the microscope usually show some definite lesion. This in the majority of cases is a condition of chronic nephritis in small isolated areas, involving the tubules or glomeruli or both. As an additional cause I would like to add a chronic lesion of the mucous membrane of the pelvis of the kidney, designated pyelitis cystica. However, there are a few instances recorded in which a careful gross and minute examination has failed to show any change whatever to account for the hematuria, and hemophilia being excluded we must conclude with Schede that the only explanation is by accepting the theory of angio-neurosis. This explanation is, however, clearly begging the question, and it would be just as well to admit that in these cases we do not know what is the underlying cause. The cause which starts the train of pathological changes in the majority of cases is probably an infection which reaches the kidney or its pelvis through the blood or from the bladder. However, only a small number of the cases of patchy nephritis or chronic pyelitis bleed.

The cause of the bleeding is unquestionably some disturbance in the blood supply to the kidney in whole or part, as displace-

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ments, changes in body temperature (taking cold), an over-distended bladder, embolism, thrombosis, and other more easily understood causes as calculus, tuberculosis, new growths, traumatism and parasites.

The quantity of blood lost may vary from a few blood cells discovered in the urine only by the microscope, to such a profuse outpouring as to endanger the patient's life. It may occur intermittently at long or short intervals, or be practically continuous. There is no special character to it to definitely distinguish it from bleeding due to other causes in the kidney. There is nothing about the hematuria to definitely locate its source, as in the kidney, ureter, bladder, or prostate. However, if the blood is thoroughly mixed with the urine, and if there is the passage of thread-like clots, the source of the bleeding is probably in the kidney.

Symptoms—The only positive symptom is the presence of blood in the urine, and the demonstration that it comes from but one kidney. There may be pain but usually this is not present, unless the kidney is congested (or distended) and its capsule stretched (as the only sensitive nerves of the kidney are supplied to the capsule). It is located behind in the costovertebral angle, and is described as a boring pain.

An attack of renal colic from the passage of blood clots will present the usual symptoms and help to localize the source of the hematuria.

Diagnosis—By means of the cystoscope and ureteral catheterization the diagnosis of unilateral renal hematuria is usually not difficult. But without direct inspection of the ureteral orifices and the use of the catheter the location of the hemorrhage is uncertain. Nothing can be absolutely predicted as to its source from an examination of the urine, and the various segregators are unreliable; there are too many opportunities for error.

By means of the cystoscope, ureteral catheter and the posterior kidney pain, the source of the hemorrhage having been located in one kidney, the determination of the cause is the next problem.

The conditions which may give rise to a hemorrhage from one kidney are commonly calculus, tuberculosis, malignant disease or movable kidney.

1. The most common is calculus. A renal colic, the passage of sand or calculi in the urine, a photograph by the x-ray showing a dark shadow in the kidney make the diagnosis almost sure, but

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blood clots may cause colic, calculi may come from the bladder or be intentionally put into the urine, and a pure uric acid stone throws no shadow under the x-ray.

2. Tuberculosis may be concluded on finding the tubercle bacilli in the urine, or by inoculating experiments, by finding tubercular foci in other parts of the body and from rapid loss of weight. Yet at times a small circumscribed tubercular lesion can exist without giving any evidence of its presence other than by the bloody urine.

3. A malignant growth attended by the tumor and cachexia may be plain, but if present to this degree the case is hopeless for surgical intervention, and earlier diagnosis may be absolutely impossible if no cancer cells are found in the urine. A severe cachexia not unlike that of malignant disease may be present from excessive loss of blood, and a tumor may be felt that is benign in its nature, but which is causing the hematuria.

4. If no other condition is found except that the kidney is abnormally mobile this may be the true cause.

5. Hematuria from a renal hemophilia would furnish evidences of this condition in the family or personal history of the patient.

There is such a strong element of uncertainty present in all the foregoing conditions that positive conclusions cannot be safely drawn until the kidney is exposed and subjected to direct examination. If then the diagnosis in such apparently obvious conditions is in doubt previous to operation, it is much more so in the class of cases to which the one here reported belongs.

By excluding the foregoing conditions, by finding blood, albumin and casts, or in the absence of blood only albumin and casts in the urine from one kidney and not the other, we may conclude that the former kidney is the seat of a chronic nephritis, probably in disseminated patches. When blood is present in the urine the reaction for albumin is, of course, obtained. In order then to ascertain the existence of an independent albuminuria, the amount of hemoglobin and albumin must be determined and comparing these an excess of albumin over the proportion of 1.6 to 1 hemoglobin points not only to an independent albuminuria but also to a renal affection as the cause of the hematuria (Newman). I do not think it is necessary to repeat here the evidence that unilateral localized nephritis may exist, and that this condition is

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sufficient to explain the hematuria. These facts seem well established. Furthermore the evidence here furnished shows that there may also exist a kidney with normal tubules and glomeruli, and with apparently a normal pelvic mucous membrane (to naked eye inspection), which, however, is the seat of chronic inflammatory changes sufficient to cause the hematuria. Of course the proof that these lesions are limited to one kidney (and that the kidney removed is the only one affected), is incomplete. But so long as the urine from the other organ contains no kidney elements we may conclude that the lesion was unilateral.

Treatment—If we were certain of our diagnosis the treatment of so-called "idiopathic" renal hematuria would be comparatively simple. But we are not sure even with the kidney exposed, split open and its pelvis exposed to view, because the lesion may be found only after prolonged microscopical examination.

The treatment may be expectant or operative. Internal medication should be tried in all cases of mild hematuria when calculus, new growths and tuberculosis can be excluded. This may be supplemented by direct irrigation of the pelvis of the kidney through the ureteral catheter with a solution of adrenalin (Young) or mild antiseptics. This treatment, while curative in traumatic renal hematuria, would hardly be effective in the class of cases we are considering. It is, however, worthy of a trial.

In patients growing progressively worse under internal treatment, if pain is present or infection exists, the treatment must be operative. Surgeons are then compelled to expose the kidney. Direct inspection may clear up the diagnosis. If the kidney is "puckered, scarred and mottled in color, irregularly or more or less toughly adherent to the surrounding tissues in places, some parts of its parenchyma look pale and yellow whilst for the most part it is deeply congested and the knife meets with different degrees of resistance" (Morris), we may conclude that the organ is the seat of a chronic nephritis. Nephrectomy should not be done as the other kidney may be similarly affected. Decapsulation after the method of Edebohls, or decapsulation with transference of the organ into the peritoneal cavity as suggested by Bakes is all that should be attempted.

For hematuria due to movable kidney nephropexy is indicated; due to a congested and inflamed kidney decapsulation is sufficient; with infection present in the kidney in addition to nephrotomy the organ must also be drained; with a chronic (microscopical)

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pyelitis one would expect that long continued drainage after nephrotomy might be curative. If circumstances permit after a nephrotomy discloses an apparently normal kidney, while the operation is arrested for a few minutes, a microscopical examination of a small section from the kidney might indicate the proper course to pursue. In certain cases all of these operations have been successful and in others all but nephrectomy have failed to arrest the bleeding.

If the conditions in the tissues surrounding the kidney, if the state of the capsule or the kidney itself does not afford a fair inference as to the cause of the hematuria; if the symptoms of hematuria, pain and disability, have been steadily increasing under persistent medical treatment; if the other kidney has been proved to be sound; and if the patient and surgeon are not prepared to undergo a possible secondary nephrectomy, the kidney should be removed, because the lesion in such obscure conditions may be chronic pyelitis or a true form of angio-neurosis which are amenable only to the more radical operations.

BIBLIOGRAPHY.

A.

Abbe. N. Y. Med. Jour., May 16, 1891.
Albarran. Ann. d. Mal. d. Org. G-U, 1897.
Albarran. L'Assen Franc. d'Urol, 1899.
Albarran. Press. Med., December 24, 1904.
Albarran. Urologie, I, 1904.
Anderson. Brit. Med. Jour., May 18, 1872.
Anderson. Lancet, April 20, 1889.
Askanazy. Zeitschrift fur Klin. Med., 1906, Bd. 58.
Askanazy. Die Nierenblutungen, Berlin, 1906, Arch. f. Klin. Chir.
Atkins. Med. Press & Circ., London, 1906, N. S. LXXXI.

B.

Bakes. Zeit. f. Chir., 1904, No. 14.
Blodgett. Vermont M. Month., Vol. XIII., 1907.
Boursier. L'Assen, Franc. d'Urologie, 1899.
Bowlby. Clinical Society's Transactions, 1887, Vol. XX.
Brewer. Surgery, Gynæcology & Obstetrics, 1906, Vol. II.
Broca. Ann. d. Mal. d. Org. G-U, 1894.
Broca. Centralblatt f. Chir., 1895.
Bullock. Practitioner, London, 1906, LXXVI.

C.

Cabot. Boston Med. & Surg. Jour., March 6, 1902.
Cabot. Post. Grad., N. Y., 1906.
Casper. Deut. Med. Woch., 1902, Vol. XXVIII.
Casper. Archiv. f. Klin. Chir., Berlin, 1906, Vol. LXXX.
Cassel. Ber. Klin. Woch., 1900, Vol. XXXVII.
Castaigne & Rathery. La Semaine Med., 1902, Vol. XXII.
Castu. L'Assen, Franc. d'Urol., 1899.
Chetwood. Med. News, N. Y., Feb. 7, 1903.
Christian. Wisconsin Med. Jour., Mil., 1906-7.

Digitized by Google

Chute. Am. Jour. Urol., Jan., 1907.
Chute. Amer. Jour. Urol., March, 1907.
Cristau. Bordeau, 1905.

D.

Dahl. Med. Standard, Chicago, 1906, Vol. XLII.
Daudois. Ann. d. l. Soc. Belge. d. Chir., Vol. V., 1897-8.
Debaisieux. Ann d. l. Soc. Belge. d. Chir., Vol. V., 1897-8.
Debersaques. Ann. d. l. Soc. Belge. d. Chir., 1898.
De Keersmaecker. Ann. d. l. Soc. Belge. d. Chir., 1897-8.
Demans. Bull. et Mem. d. l. Soc. d. Chir. d. Paris, 1898.
Doubre. Bull. Medical, 1898.
Dowd. Annals of Surgery, Vol. XLII.
Durham. Brit. Med. Jour., May 18, 1872.

E.

Edebohls. N. Y. Med. Jour., May 21, 1904.
Ekehorn. Abstract Centralblatt fur Chir., 1906, No. 16.
Elb. Zur Kenntniss der renalen Hæmophilia, Berlin, 1895.
Ellerich. Archiv. of Pediatrics, March, 1900.
Eshner. Jour. Amer. Med. Sci., Phila., April, 1903.

F.

Fenwick. Brit. Med. Jour., 1900.
Fowler. N. Y. Med. Jour. & Phila. Med. Jour., 1905, Vol. LXXXII.
Folwer. Johns Hopkins Hosp. Rep., No. 13, 1906.
Freeman. Annals Surgery, March, 1904.

G.

Gallet. Ann. d. l. Soc. Belge. d. Chir., Vol. V., 1897-8.
Garrod. Hæmaturia, Tr. M. Soc., London, 1905, Vol. XXVIII.
Genouville. Ann. d. Mal. d. Org., G-U, 1898.
Gunn. Dublin Jour. Med. Sci., 1905, Vol. CXX.
Gunn. Tr. Roy., Acad. Med., Ireland, Dub., 1905, Vol. XXIII.
Guthrie. Lancet, May 3, 1902.
Guyon. Ann. d. Mal. d. Org., G-U, February, 1897.

H.

Hammel. These d. Paris De l'Hæmaturie essentielle, 1897.
Hamonic. L'Assen, Franc, d'Urol., 1899.
Harris. Med. Jour. Phila., March 19, 1898.
Heymann. Deutsch, Med. Woch., Leip., U. Ber., Vol. XXXII., 1907.
Hofbauer. Mitteil a. d. Grenz. d. Med. u. Chir., Bd. X., 1899.

I.

Illyes. Pest. Med-chir. Presse, Budapest, Vol. XLII., 1906.
Imbert. Ann. Des. Mal des Org. G-U, 1899, Vol. XVII.
Imbert. L'Assen. Franc. d'Urologie, 1899.
Israel. Arch. f. Klin. Chir., Vol. XLVII., 1894.
Israel. Mitt. a. d. Greuz. der Med. und Chir., 1899, Vol. V.
Israel. Klinik der Nierenkrankheiten.
Israel. Deut. Med. Woch., No. 9, 1902.

J.

Jallard. Lancet, May 3, 1902.

K.

Keefe, J. W. Am. Jour. Urol., N. Y., 1907, Vol. III., No. 2.
Klemperer. Deut. Med. Woch., 1897, Nos. 3 & 4 and 9 & 10.
Klemperer. Die Therapie der Gegenwart, Vol. III., 1901.
Klemperer. Deut. Med. Woch., Vol. XXVIII., 1902.
Klink. Centralblatt f. Grenz. Med. u Chir., 1903, Bd. VI.

L.

Lauenstein. Deut. Med. Woch., No. 26, 1887.
Laurent. Deut. Med. Woch., No. 13, 1901.

Digitized by Google

Legueu. Rev. gen. de Chir. et de Therap., Paris, Vol. 15, 1906.
Legueu. Ann. d. Mal. d. Org. G-U, 1891.
Legueu. L'Assoc. Franc. Urolog., 1904, Vol. VIII.
Lewitt. Urologie, Bd. 9, Hft. 6.
Loumeau. Bull. et Mem. d. l. Soc. d. Chir. de Paris, 1898.
Loumeau. Ann. d. Mal. d. Organ. G-U, Vol. XVII., 1899.
Luys. Clinique, Paris, Vol. I., 1906.

M.

MacGowan. Med. News, 1901.
Malherbe & Legueu. L'Assen, Franc. d'Urologie, 1899.
Mery. J. de Med. et Chir. prat., Paris, Vol. LXXVII., 1906.
Morris. Surg. Diseases of the Kidney and Ureter, Vol. I.
Myles. Med. Press & Circ., Aug. 23, 1899.

N.

Naunyn. Mitt. a. d. Grenz. gebieten der Med. u Chir., 1899, Vol. V.
Naeve. St. Barth. Hosp. J., London, Vol. XIII., 1905-6.
Newman. Glasgow Med. Jour., 1901.
Newton. Australasian Med. Gazette, Dec. 20, 1902.
Nicholich. L'Assen, Franc. d'Urol., 1901.
Nicholich. L'Assen. Franc. d'Urol., 1904, Vol. VIII.
Nimier. Bull. et Mem. d. l. Soc. d. Chir. d. Paris, 1898.
Nonne. Deut. Med. Woch., 1902, Vol. XXVIII.

O.

Oliver. International Clinic, Vol. III., 1895.

P.

Passet. Centralblatt f. d. Krank d. Harn u. Sex. Org., 1894.
Pasteau. L'Assen. Franc. d'Urologie, 1899.
Pel. Mitteil a. d. Grenz. d. Med. u. Chir., 1901.
Picque & Reblauber. Ninth Cong. of Surg., Paris, 1895.
Poirier. Bull. et Mem. d. l. Soc. d. Chir. d. Paris, 1898.
Potherat. Bull. et Mem. d. l. Soc. d. Chir. d. Paris, 1898.
Pousson. Bull. et Mem. d. l. Soc. d. Chir. d. Paris, 1898.
Pousson. La Semaine Medical, 1898, Vol. XVIII.
Pousson. L'Assen, d'Urologie, 1899, 1900 & 1904.

R.

Rovsing. Brit. Med. Jour., London, Nov. 19, 1898.
Rovsing. Centralblatt f. Krank. d. Harn. u. Sex Org., 1898.
Rovsing. Mitteil a. d. Grenz. d. Med. u. Chir., Bd. X.

S.

Schede. Jahrbuch d. Hamburger Staats Krankenanstalten, 1899.
Schenck. Med. News, December 24, 1904.
Schuller. Wien Klinische Rundschau, Band. XIX., No. 13.
Schuler. Med. Press & Circ., London, 1906, N. S. LXXXI.
Sebatier. Rev. d. Chir., Vol. LX., 1889.
Senator. Deut. Med. Woch., 1902, Vol. XXVIII.
Senator. Berl. Klin. Woch., Band. 28, 1891.
Staveley. Johns Hopkins Hosp. Bull., 1893.
Steinthal. Beit. Z. Klin. Chir. Tübing., Vol. LIII., 1907.
Stitch. Mitteil a. d. Grenz. d. Med. u. Chir., Band. XIII., 1904.
Suter. Centralblatt f. Kr. der Harn und Sex Org., Berlin, 1902.

T.

Tedenat, L'Assen. Franc. d'Urol., 1899.

V.

Vincent, W. G. N. Y. Med. Jour., Vol. LXXXV., 1907.
Vogel. Berl. Klin. Woch., Vol. XLIII., 1906.
Von Angerer. Arch f. Klin. Chir., Vol. LXXXI., 1906.
Von Bergmann. Handbuch d'Prakt. Chir., Band. V.

Digitized by Google

W.

Walker. Clin. Jour. London, Vol. XXVII., 1905-6.
Williams. Med. Press & Circ., London, N. S. LXXXI., 1906.
Wulff. Munich Med. Woch., No. 29, 1903.

Y.

Young. Jour. A. M. A., May 18, 1907.

Z.

Zondek. Deutch. Med. Woch., 1902, Vol. XXVIII.

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URETHRAL CALCULUS.

By John J. McGrath, M. D.,

Visiting Surgeon, Harlem Hospital; Professor of Operative Surgery, New York Post-Graduate Medical School and Hospital.

James B., aged 24 years, entered the Harlem Hospital upon the suggestion of Dr. Frederick E. Bauer, December 14, 1907.

The patient stated that four weeks before admission he began to experience difficulty in urination, delay in starting the flow and diminution in the volume of the stream. The difficulty gradually increased until, for the past few days, the urine has been discharged in drops and only with considerable straining and some pain. Finally, for the past sixteen hours he has been unable to pass any urine whatever. Previous to the beginning of his present trouble, dating back four weeks, he claims that he has had no symptoms of any kind referable to the bladder or urethra. He had never passed any blood.

Upon admission the patient was found to be suffering from retention of urine. The bladder was very much distended. An attempt to introduce a catheter into the bladder was not successful, and a metal instrument met with an obstacle which prevented its passage and which communicated a distinct, gritty sensation and click. A hard lump, the size of a pigeon's egg, could be felt in the perineum just back of the scrotal fold. This mass was not adherent to the skin and was not especially tender.

Under ether anesthesia an incision was made in the middle line of the perineum down through the mass, and a stone was removed which is represented in the accompanying illustration (Fig. 1). The stone was found lodged in the bulbous portion of the urethra. The wall of the urethra was much thickened and swollen and fitted snugly around the stone. After the stone was removed, a sound was passed from the incision in the perineum, through the deep urethra, into the bladder. No further stones were detected in the bladder. The calibre of the deep urethra accommodated a No. 30 French sound, and was certainly not sufficiently roomy to permit the passage of such a large stone as the one which had been removed from the bulbous portion. The patient was discharged from the hospital cured, December 30, 1907.

Vesical calculi are not infrequently driven from the bladder into the deep urethra and, if not too large, may traverse the entire length of the urethra and thus escape. Larger stones usually become impacted, completely blocking the urethral canal, and cause acute retention which continues until relieved by a surgical operation. In the case, the history of which is given

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above, the stone had evidently been lodged in the urethra for some time and, apparently, without causing any discomfort, to judge from the patient's story. It probably escaped from the bladder as a small uric acid stone, as represented by the nucleus seen in the illustration of the cut section of the stone (Fig. 2). It passed through the prostatic and membranous portions of the urethra and became arrested in the comparatively roomy bulbous portion. In this location it remained without causing any urgent symptoms, permitting the urine to flow past it, between it and the urethra wall, ball-valve fashion, gradually increasing in size and assuming the form of a cast of the bulbous portion of the urethra by the deposit of phosphates, until it reached its present size and, finally, a slight increase in the swelling of the mucous membrane of the urethral canal was sufficient to completely block the canal and shut off the escape of urine.

An interesting feature is the tolerance of the urethra to the lodgment of a calculus for the considerable period necessary to have resulted in the large stone exhibited. It could not have escaped from the bladder in its present size and, according to the history, it did not begin to cause inconvenience until four weeks before operation, when it had probably acquired sufficient size to seriously obstruct the urethral canal. How long before this time the stone in its original form had entered the urethral canal, is uncertain. There is nothing in the history to determine this time.

Examination of the stone, section and photographs were made in the laboratory of the Post-Graduate Hospital under the direction of Professor H. T. Brooks, who reports that the nucleus of the calculus is composed of uric acid, and the outer layers of calcium carbonate, calcium phosphate and ammonio-magnesium phosphate.

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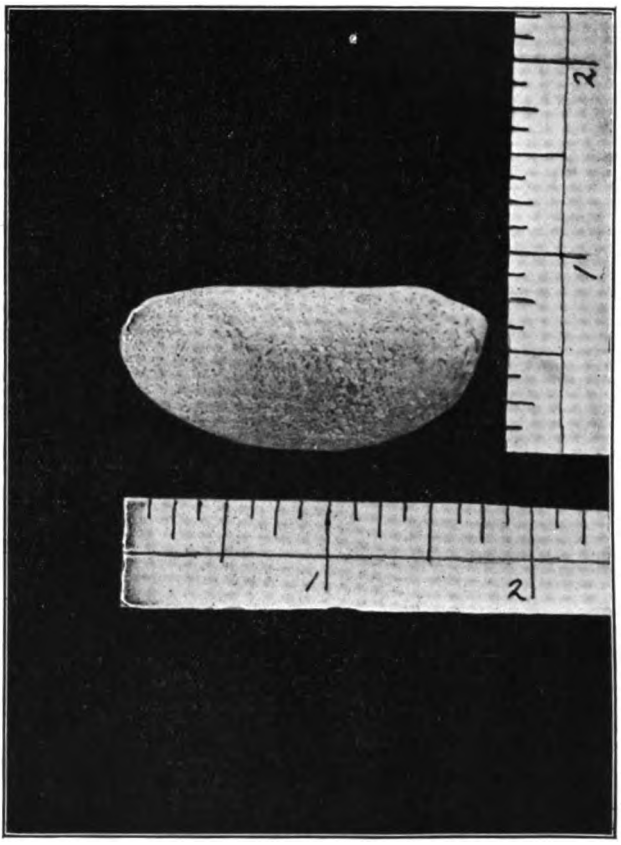

FIG. 1.—Showing dimensions of the calculus.
(McGrath)

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FIG. 2.—Section of the stone showing its layer formation and uric acid nucleus.

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A METHOD OF OPERATION IN EXTENSIVE CANCEROUS GROWTHS OF THE CHEEK INVOLVING THE JAW.*

By Lucius W. Hotchkiss, M. D.,

Visiting Surgeon to Bellevue and Junior Surgeon to Roosevelt Hospital; Associate in Clinical Surgery, College of Physicians and Surgeons.

Primary cancer of the mucous membrane of the cheek is a rare disease. Beginning often as a small ulcer at the site of an abrasion, or caused, perhaps, by the irritation of the sharp edge of a carious tooth, it spreads more or less rapidly, until it finally involves the whole thickness of the cheek. Laterally, it spreads to and involves the alveolar processes of one or both jaws, the hard palate, sometimes the floor of the mouth, and may extend backward to the pillar of the fauces and tonsil.

In the early stages it may not give rise to much pain, but sooner or later it is apt to take on the character of a rapidly spreading septic inflammation of the cheek, causing great pain, as soon as the branches of the fifth nerve are implicated, and trismus from spasm and infiltration of the Masseter muscle. If seen at this stage, and the previous history is not carefully inquired into, the real nature of the condition may pass, for a time at least, entirely unsuspected. When the outer skin of the cheek becomes involved in the extension of the growth, perforation and the formation of a foul ulcer communicating with the mouth rapidly follows and the wretched patient worn out by the pain, and loss of sleep, and partial starvation on account of the difficulty in mastication and swallowing, rapidly loses ground, and dies of exhaustion and sepsis, unless his sufferings are more rapidly ended by the development of an intercurrent pneumonia.

Curiously enough, glandular involvement of the tributary lymphatics is not necessarily deep nor extensive, even in advanced cases, as instanced in my own, and internal metastases may not be present at any time. It is this astonishing fact alone which gives us courage to attack these apparently hopeless cases

* Read at a meeting of the Society of Alumni of Bellevue Hospital, New York, March 2, 1908.

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by radical surgery, in the hope of affording even a lasting relief in some of them.

The magnificent work of Crile, in a large series of operations for the removal of extensive cancerous growths of the neck and face, by a block removal of all the affected tissues, whether bone, or soft tissue, after a temporary closure of the common carotid artery by his special clamp, points the way to results supposed hitherto to be unattainable.

A statistical paper* of great value, published last year by Anton Meller in the Zeitschrift für Krebsforschung, 1907, 16, 64, gives the results of a careful study of epithelial carcinoma of the head and neck, based upon the review of 327 cases of epithelioma observed in Hochenegg's clinic in Vienna, between the years 1894 and 1904.

The accumulated figures obtained from the study of such a great number of cases cannot help but be useful, and in this special instance, stimulating. It should serve also to correct various erroneous impressions which exist and which may have been derived from an unfortunate personal experience or from too hasty generalization based upon insufficient observation.

The results of the operation in this great series of cases are most interesting and suggestive. For example, it was found that in 50 per cent. of them there was no recurrence after operation, within the three-year period, and of those cases which were operated on for recurrence, 21 per cent. remained free. Meller found, moreover, that recurrence when it did occur was most often local, rather than in the glands, and that internal metastases had rarely occurred before the patients came to operation.

He found also that cancers in certain regions were more dangerous as regards glandular metastasis than in others; for instance, in the case of the lower lip, this involvement was found in 90 per cent. of all of them, while in cancer of other parts of the head and face gland involvement was observed in but 18 per cent. to 43 per cent. It was found, moreover, that the removal of infected glands up to the size of a pea or walnut always gave good results when they only occurred in small groups or singly, but in those cases where the glands could be followed down to the clavicle, others would usually be found in the mediastinum.

Finally, it was found that in really "inoperable" cases an operation materially hastened the end by hastening extension

* Zur Statistik der Hautcarcinome des Kopfes und Halses.

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along the opened up channels and mutilated tissues; and Meller declares boldly that similar bad results often follow rough attempts at removal of perfectly operable growths by inexpert operators in this field of work; which statement is borne out by the observations of most surgeons.

During the past year, three cases of extensive epithelioma of the inner lining of the cheek and involving the jaw have come under my care, and the condition in all of them was so distressing that an extensive mutilating and dangerous operation seemed justifiable as a measure of relief, even though the chances of a radical cure seemed somewhat problematical. The experience gained in my attempts to effect the removal *en bloc* of all the visibly infected tissues, whether bone, muscle or skin, in an orderly and comparatively bloodless manner, may not be without interest to those of you who may be called upon to advise or operate in similar cases.

In the first case, operated upon in June, 1907, at the Roosevelt Hospital, much valuable experience was gained, and an operative technic developed which was useful in the later cases which form the basis of this paper. Operative recovery resulted in this, as in the other cases, but recurrence at the site of the scar took place within two months, which, on account of the patient's age (65) and rather feeble condition, was not subjected to further operation, and he died of exhaustion in about four months from the time of the operation. In this case a large piece of the cheek and nearly one-half the lower jaw were removed, and the defect was closed in by a plastic flap taken from the skin of the neck. The growth in this first case was more closely localized to the mucous membrane of the cheek and the alveolar process of the lower jaw than in the later cases, and in a younger and more vigorous subject an operation would doubtless have given more lasting results.

In the two cases which form the real basis of this paper, and in which the steps of the operation to be described were developed, the growth had involved a very wide area, as will be seen. and while too short a time has elapsed to predicate the ultimate result, the writer feels that as recurrence at the site is more probable in these cases than at a distance, and with the hope that it may be perfectly feasible to deal with such recurrence in the event of its appearance the operation is not only a justifiable procedure but really a desirable one even if it affords only a respite from the suffering that these unfortunates are obliged to undergo.

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Both cases are alive and well at the end of about three months, and both are steadily gaining weight, the first one having gained about twenty pounds and the second about ten pounds.

The following is a review of the history of these two cases:

CASE 1.—Francesco de G., Italy, male, age 43, ragpicker, admitted to Bellevue Hospital, January 6, 1908. In America five years. Irregular habits as to eating, drinking, and sleeping; moderately alcoholic; smokes and chews tobacco; syphilis, doubtful; generally in good health; family history negative.

Present Condition—About a year before a small "pimple" appeared upon the inner surface of the left cheek and was cut out by a physician, but never healed. The growth in the mouth began to ulcerate and to extend laterally and in depth, until the cheek was perforated about three months ago, since when his condition has become more and more wretched. There is no history of injury to the jaw, but the teeth have always been bad he says, though those adjacent to the growth had never troubled him and appear to be sound.

Examination revealed an ulcer involving the whole thickness of the left cheek about the size of a silver half dollar, its centre opposite the 2nd molar tooth, its edges hard, irregular in outline and undermined, and the surrounding tissues widely infiltrated. There is a very foul smelling discharge from the ulcer and it is mixed with the saliva which is very abundant and very offensive. The pain extending up into the head is very distressing and sleep without opiates is impossible. There is spasm of the Masseter muscle with marked trismus, and it is difficult to pry open his jaw, even a little, to examine the inside of the cheek and determine the extent of the growth. The patient is beginning to emaciate and is rapidly losing strength. His feeding is limited to fluids, part of which are lost through the large whole in the cheek.

The lymphatic glands below the jaw are considerably enlarged and adherent to the skin and each other, but do not extend very far down the side of the neck, *i.e.*, apparently not below the level of the cricoid cartilage.

Examination of a section of the edge of the ulcer shows it to be epithelioma. The patient has been refused operation at two hospitals, but in view of his age (43) and the comparatively small glandular metastasis, as well as of his urgent prayer for relief from his wretched condition, the operation was undertaken on January 11, 1908.

CASE 2.—Walter T., United States, laborer, age 52, admitted to Bellevue Hospital January 1, 1908. Family and previous history, negative. Generally in good health; moderately alcoholic; smokes and chews tobacco; pretty steady pipe smoker and in the habit of tucking his pipe into the right angle of the mouth, *i.e.*, on the affected side. His trouble began five months before with a small ulcer in the mucous membrane of the right cheek at a point which was constantly irritated by being caught between his teeth. The ulcer increased in size, slowly at first, but lately the whole cheek has become involved in what seemed to him an inflammatory process. Six weeks before he began to suffer from pain of increasing severity, which pain was in the cheek and extended up into the head and lately it had be-

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come so severe that he could not sleep, and an increasing stiffness in the movements of the lower jaw had rendered eating a painful and unsatisfactory process.

Examination shows a deep ulceration of the mucous membrane of the right cheek about opposite the second molar tooth, and extending to the alveolar process and backward to an extent undetermined on account of the inability to pry open the mouth wide enough to get a better view. The lymphatic glands in the submaxillary region were enlarged, very hard, but were not adherent to the skin nor did they extend far down the side of the neck.

The heart and lungs are normal and there is no evidence of internal metastasis. Section from the growth shows it to be epitheliomatous, and an operation was advised. During his stay in the hospital his condition became more unbearable and the growth increased in extent until the cheek was finally perforated the day before the operation, which was done January 20, 1908.

Both cases, it will be noticed, were comparatively young men, and, while their condition was far from promising, they both willingly submitted to operation. As the tissues of the cheek were very widely involved in both cases, necessitating a wide opening into the cavity of the mouth, it became evident that some form of plastic operation would have to be devised, which would provide for the immediate closure of this gap, provided it would not add materially to the length and danger of the procedure.

With this in view, a plan of operative attack was worked out by which the growth in the cheek and jaw could be removed, together with the infected tributary lymph-nodes in the neck, in one piece, from below upward, with the least possible shock and hemorrhage, and the hole in the cheek rapidly closed by a plastic flap taken from the neck and turned back in the course of the exposure of the cervical lymph-glands to be removed.

Description of the Operation—An incision (1, 2, 3, 8, 4—Fig. 1) was made through the skin, and the flap 1, 2, 3, 8, was turned forward toward the median line, exposing the lower border of the inferior maxilla, the platysma overlying the submaxillary gland, and the deep structures of the neck.

The sternomastoid muscle was freed along its anterior border, thus exposing the chain of enlarged glands extending from the submaxillary space to below the level of the cricoid cartilage. Beginning below, the entire chain of lymphatic glands along the internal jugular vein and beneath the sternomastoid muscle was removed, together with any periglandular fat that might be adherent to them, in one piece, from below upward, until the bellies of the digastric came into view, and then the contents of the

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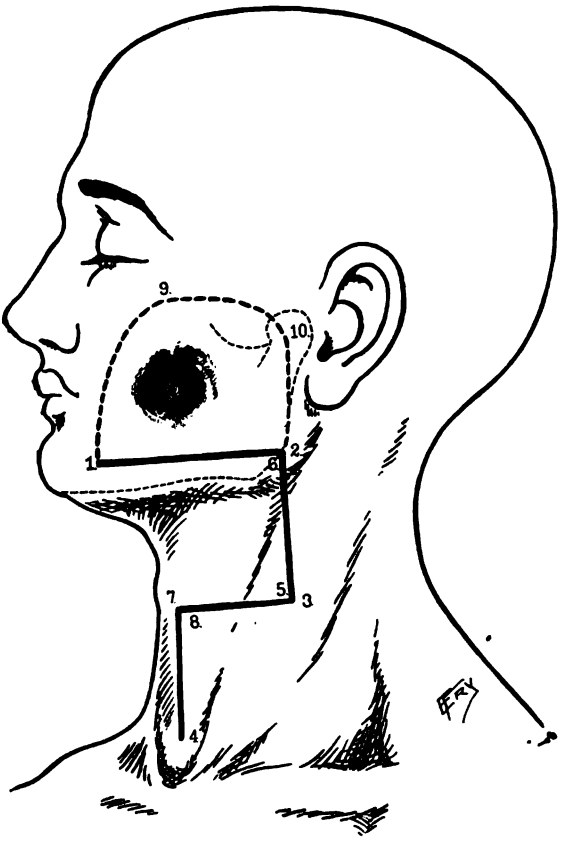
submaxillary space both the salivary and the lymphatic glands were shelled out cleanly and retracted upward in one piece. The external jugular and facial veins were ligated and divided, and the external carotid artery was isolated and divided between ligatures of chromic gut, just above the origin of the superior thyroid branch. The outer surface of the lower jaw having been ex-

FIG. 1.



The heavy lines mark the outline of the flap from neck to cover defect left in cheek, portion circumscribed by dotted line.

posed and cleaned ready for section, and the neck-wound protected by gauze packing, the skin of the face was divided in such a manner as to widely circumscribe the growth along line 1, 9, 10, 2 (Fig. 1) and the mouth rapidly entered. The jaw was then divided with a gigli saw through the socket of the canine

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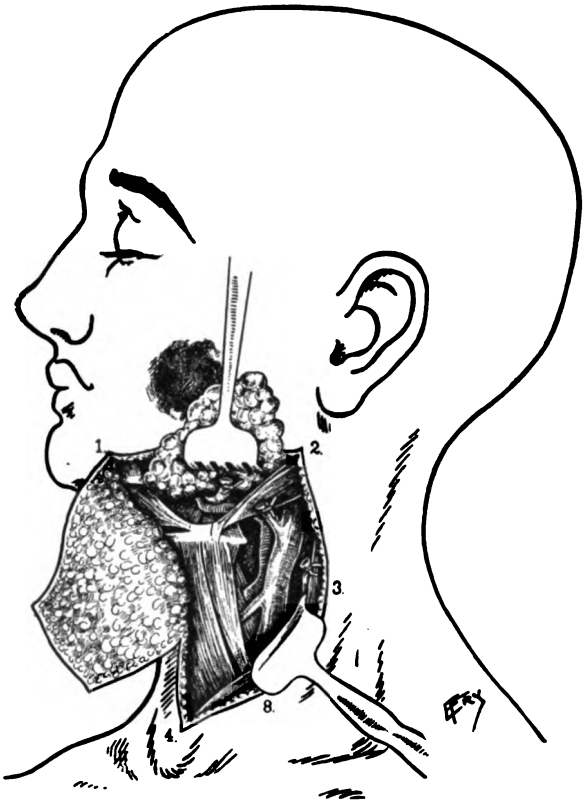
tooth, the extent of the growth within the mouth being now plainly visible. When the cut end of the jaw was retracted, incisions through the mucous membrane well clear of the growth were made.

The mucous membranes and structures of the cheek were divided along the alveolar margin of the upper jaw, back to the

FIG. 2.



Skin flaps retracted, showing exposure obtained. Deep glands dissected up and extracted. External carotid ligated.

molars and the floor of the mouth was divided along the groove of the tongue. This severed the mylohyoid and the hyoglossus muscles. The inferior maxilla and attached structures were then retracted outward, and, as the growth, in Case 2, was found to involve the posterior border of the alveolar process of the upper jaw and hard palate. The alveolar process of that bone was

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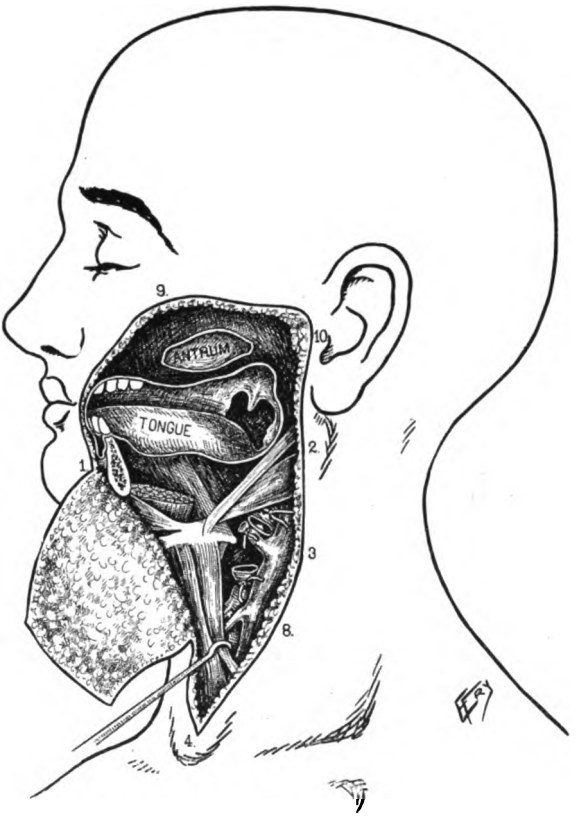
removed with a chisel from as far forward as the canine tooth and with it, the floor of the antrum, the pyramidal process of the palate bone, the lower end of the internal pterygoid plate, with hamular process, the lower end of the external pterygoid plate, and a portion of the malar bone (Figs. 2 and 3). Upon dis-

FIG. 3.



Tumor removed with large portion of cheek and one-half the lower jaw and portion of upper jaw. Cavity of mouth opened.

articulating the inferior maxilla rather sharp venous oozing ensued, but was easily controlled by gauze packing.

To close up the large defect left in the cheek, the mucous membrane at the side of the tongue was united to the cut edge of the hard palate, the tongue thus being elevated as a sort of wedge against leakage from the mouth. The edges of the cut

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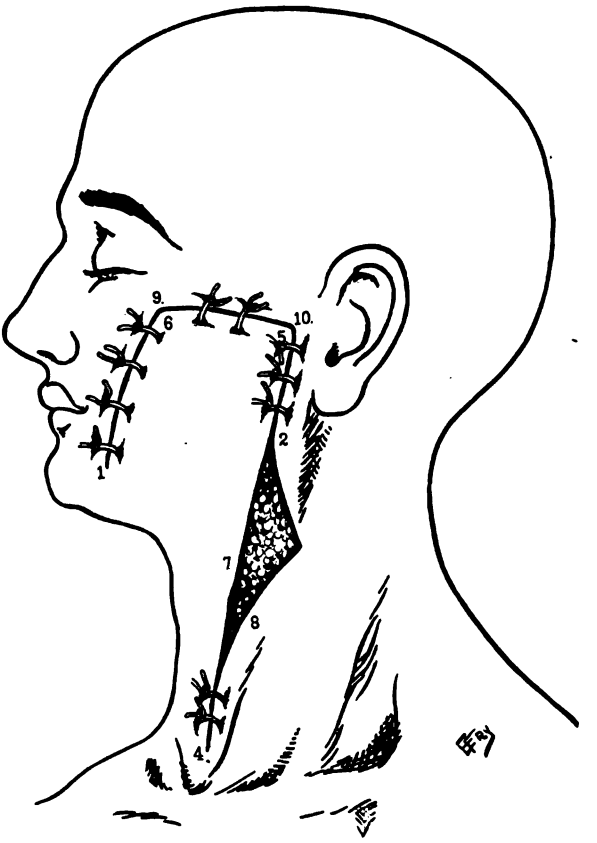
mucous membrane in front and behind this were united by suture, and the cut edge of the mylohyoid muscle was brought up over this line of union of the mucous membrane, and the skin flap shown in Fig. 4 was then sutured up to fill in the defect in the cheek. A portion of the incision in the neck was left unsutured

Fig. 4.



Plastic flap from neck sketched in place covering defect in cheek.

and filled with loose gauze packing extending up to the glenoid and temporal fossa, and this packing was left in place for several days until granulation was established.

The essential features of the operation are rapid, clean dissection with a sharp knife, careful retraction to avoid bruising

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of the tissues, isolation and removal of all the glands and infected fat in the area tributary to the growth, preferably from below upward, and with the least possible handling, ligation of the external carotid artery or temporary compression of the common carotid, after the method of Crile, stopping all bleeding, and finishing the work in the neck and clearing the jaw before the cavity of the mouth is entered, then rapidly removing the tumor, skin, bone, and infected glands, *en bloc,* and completing the operation as soon as possible by stitching the plastic flap into place and providing for drainage and suture of the neck.

The use of the tongue as a barrier to help close in the defect in the cheek is practical and tends to diminish the chances of early leakage from the mouth. The patients are bolstered up in bed as soon as out of ether and set up in a chair the second day if possible. Feeding through a tube passed through the nose becomes a necessity during the first few days after operation, especially if the rectum is intolerant, and allows healing to take place with the minimum of leakage and infection. Moderate infection occurred in both cases, but was not ever a serious factor. Some sloughing of the flap occurred in the first case, as it had to be shaved very thin by reason of the subcutaneous cancerous involvement, and the skin defect remains in cheek. In the second case, the flap was very effectual, although there are still one or two small points, rapidly closing in, where slight leakage from the mouth has occurred. Both patients are entirely relieved of their pain and both can eat solid food with comfort.

This operation, as described, is offered as an available method of attacking extensive growths of the cheek and jaw, the removal of which necessitates a wide opening into the cavity of the mouth, and in which it may seem best to do the operation in a single sitting instead of in two stages.

It is original, in so far that the writer has never seen it done or described, but in this day of surgical progress one hesitates to call any operation a new one.

The photographs were taken before the complete healing of the wounds and are offered merely to show the general outline of the plastic flap, and the deformity resulting from so extensive an operation. It will be noticed in the photograph of Case 2 that the cosmetic result is much the better, although the bone removal was much more extensive, possibly because the lower jaw was

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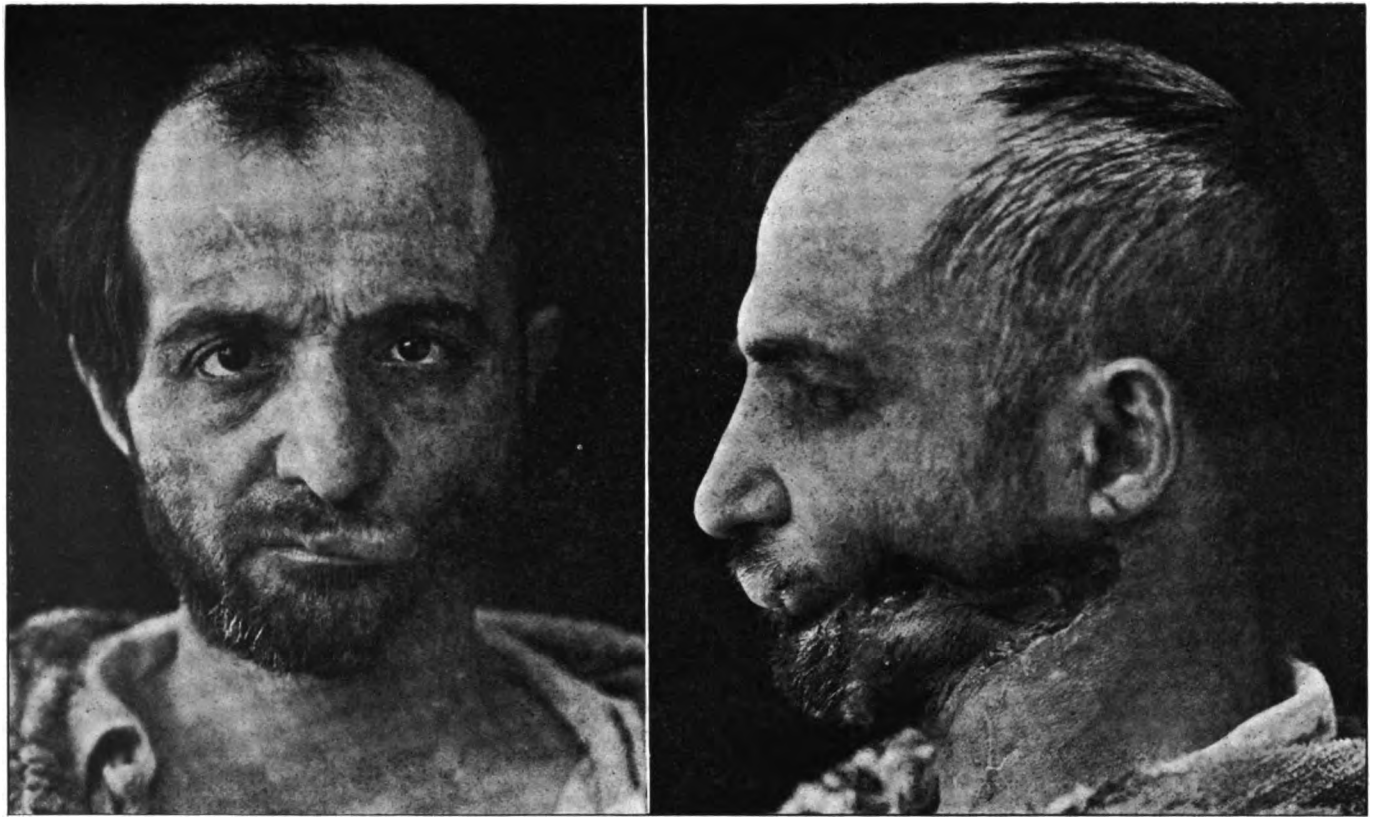
FIG. 5.



Front view, showing deformity about three weeks after operation.

Side view, showing plastic flap with partial neurosis of upper edge and angle.

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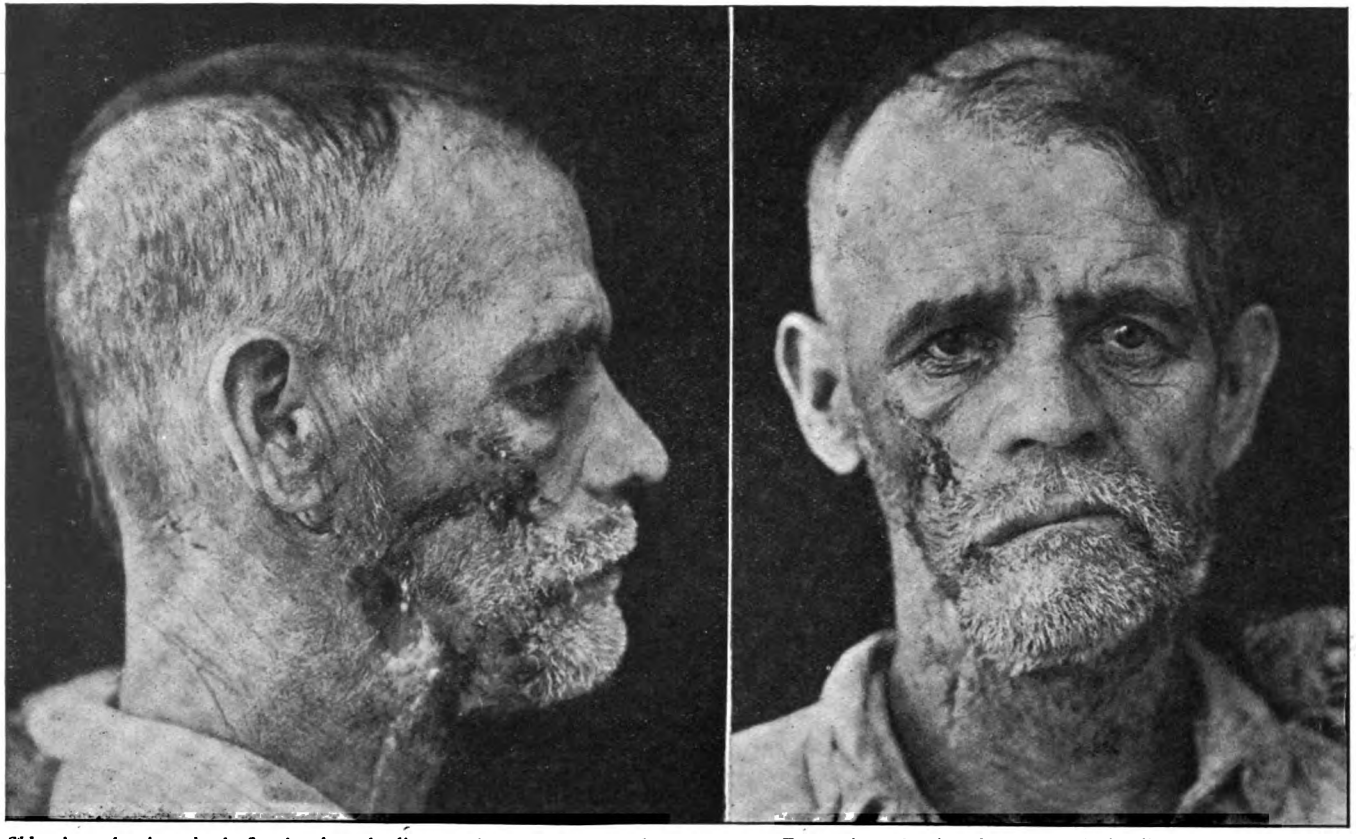
FIG. 6.



Side view, showing plastic flap in place, healing nearly perfect two weeks after operation.

Front view, showing the temporatively slight deformity.

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sawn farther from the median line in this case, thus preserving the outline of the chin.

At the end of three months there is a slight local recurrence in the upper edge of the cheek opening in Case 1 which will be promptly removed. In Case 2 there are no evidences of recurrence. Both cases have enjoyed a period of complete respite from their sufferings, and both appear to be in good physical condition.

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SOME UNUSUAL CASES FROM THE EYE SERVICE OF FORDHAM HOSPITAL.

By Charles Graef, M. D.,

Oculist and Aurist to Fordham Hospital; Clinical Professor of Ophthalmology, Fordham Medical College.

The following cases, which have recently been under my care, seem of sufficient importance and interest to warrant reporting in some detail:

Case I.—H. S., a man, 52 years of age, came to see about a change in his glasses—presbyopic—and incidentally asked me to look at the stump of his left eye, over which he was wearing a glass shell. Something more than twenty-six years ago (December 25, 1881), in Germany, he was struck in the left eye with a beer glass. The eye was so badly injured that it was removed next day by an ophthalmologist. No attempt was made to wear a glass eye over the stump until 1884. The patient had then arrived in New York, and after an operation on the stump at the Ophthalmic Institute in Twelfth street, to prepare it for the reception of an artificial eye, a glass shell was worn continuously until the present time.

He called my attention to it because he had lately noted occasional twinges of pain in the stump and for a month or more the upper lid, especially the inner half, was noticeably swollen. Examination of the stump showed a pouting opening of small size at one point, and feeling in this with a probe I struck a hard substance which gave the impression of glass. The patient was positive that nothing had happened to the stump since the original injury, but as I could plainly make out with the probe that a piece of glass of considerable size was embedded, I cocainized the tissues and dissected it out.

It proved to be a large fragment of the beer glass. It is shown in the accompanying photograph.

I could not feel any other pieces at the time, but I kept the wound open with a small gauze drain and several days later secured the smaller fragment also shown in the photograph. Careful search and observation of the wound failed to reveal more; the wound closed and the lid swelling disappeared.

The patient has never had any irritation of the right eye or any suggestion of difficulty with the stump in the long period during which the glass lay there. He has been under the care of several ophthalmologists in New York at various times chiefly for attention to his glasses. They examined the stump from time to time. but found nothing amiss. He had some power of movement with the stump at first, but this disappeared

Reprinted from the New York Medical Journal for June 20, 1908.

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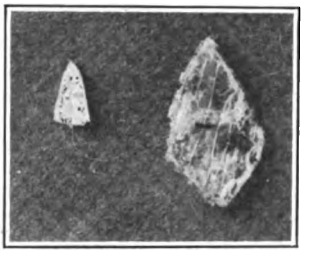
about six years ago. A considerable measure of this has returned since the removal of the glass. An x-ray examination of the part failed to reveal any more pieces in the tissue of the orbit, which seems fairly conclusive, since the glass fragments show up clearly when held in the closed hand under the fluoroscope.



Fragments of a broken beer glass, removed from the stump of an injured eye after lying embedded over twenty-six years. A glass shell had been worn over the stump for nearly the full period after enucleation. The photograph is a little less than the actual size of the pieces.

Case II.—E. J., a lad of 10 years, was struck in the left eye by a bullet fired with an air rifle by a playmate from a distance of about twelve feet. He did not come to the hospital until two weeks after the injury, at which time little evidence of external injury was to be seen at first glance. There was some photophobia with haziness of the cornea, but little or no injection of the conjunctiva. The boy explained that he and his friends were able to see the bullet still in the eye, however, and on drawing down the lower lid it was found lying under the deepest part of the bulbar conjunctiva. It was easily removed from its apparently sterile resting place by snipping through the conjunctiva over it. It had evidently struck the bulb a little below the corneal margin with force enough to penetrate the conjunctiva. The tough sclera had resisted and deflected it, much as a rib does a musket ball, to the point where it was found.

The eye was badly injured by the blow. Fissured opacities traversed the lens in several directions, and the cornea had likewise numerous fissures running in various directions and giving it the appearance of cracked mica, the result of disturbed nutrition. The fundus showed a wide area of chorioretinitis with exudate and hæmorrhages scattered over the lower and outer part of the field. Vision was reduced to counting fingers at two metres. This has improved under treatment one-sixth.

Case III.—J. F., a young man of 31, was suddenly attacked while on his way to work in the morning with fainting, nausea, and vomiting. He had been in his usual good health previously and had no idea what could have brought on the condition. He was unconscious when brought to the hospital in the ambulance and remained so for nearly forty-eight hours.

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He vomited several times and complained of headache when recovering consciousness.

Examination of the chest proved negative except for a diastolic heart murmur, heard loudest in the fourth left intercostal space. Abdominal and repeated urine examinations were also negative.

Eyes: Complete temporal hemianopia with an excellent example of Wernicke's hemiopic pupillary reaction, that is, the pupils reacted to light when this was thrown on the temporal half of the retina of each eye, but did not react when the light was directed to the nasal or blind half of either retina, showing an interference with the nerves in the chiasm, where the nasal portions of each nerve cross to the opposite side.

There was some blurring of the disc edges, but the eye grounds were otherwise normal. He had a convergent squint of about 20 degrees, but this had been present from early childhood.

There was absolutely no history of, nor any evidence pointing to, specific disease. The ears were normal. The left side of his nose was badly occluded by a marked deflection of the septum to that side with thickening. He had some postnasal dropping and evidence of disease in the posterior ethmoid cells and sphenoid sinus of the left side.

The case cleared up completely with rest in bed. While it looked like a condition due to hemorrhage the age and general state of the patient were against such a diagnosis, and the presence of the nasal faults made it likely that conditions in the sphenoid sinus were responsible for the trouble.

CASE IV.—W. J., a young man, was struck in the left eye with the prickly husk of a chestnut while looking upward into a tree on a nutting expedition. When he presented himself next day for treatment, the cornea and conjunctiva were literally peppered with the barbed spicules from the burr and a severe inflammation had set in.

Something more than twenty of the small thorns were removed at the first visit. A number had to be left, as they were broken off in the tissue and an excessive amount of digging would have been required to remove them. Unless one has had to deal with such a case it is difficult to appreciate how troublesome the removal of such slender spicules, deeply embedded in the cornea, may be. There happened to be attending the clinic at the same time a patient who had suffered a similar accident some years ago. The vigorous effort made in his case to clear out all the spicules was followed by reaction so severe that the eye became of little use for visual purposes.

Careful watching of the injured eye, with the use of atropine, warm bathing, and suitable collyria, made it possible to remove the embedded spicules one by one as they betrayed their presence. The œdema and softening of the cells immediately about them rendered this comparatively easy. In this way all were finally disposed of with excellent results.

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A NEW, SIMPLE, AND READY METHOD OF DROPPING ETHER FROM THE ORIGINAL CAN.*

By Joseph E. Lumbard, M. D.,

Anesthetist to the Harlem Hospital; Formerly Anesthetist to Mount Sinai Hospital; Fellow New York Academy of Medicine, Etc.

The drop method of administering ether is to-day interesting a greater number of surgeons and anesthetists than ever before. Numerous dropping bottles, as well as dropping devices to be inserted into the can, have been contrived, but I believe that valid objections can be raised against all of them to which the method about to be described is not open. One objection to a special bottle is that it is not advisable to remove a good ether, for use as an anesthetic, from the original tin to another container, lest thereby it absorb moisture or become contaminated otherwise. An objection to any particular contrivance to be attached to the can is that such is an extra piece of apparatus, which may not be at hand or may be out of order when it is wanted, while, further, both special bottles and droppers are a continual extra expense.

My method of dropping ether requires no special apparatus, therefore it involves no extra cost. Moreover, I have found it is at all times easy to manage and fulfills perfectly the end desired. Furthermore, I believe it to be original with me, for by a careful searching of libraries I cannot find it either pictured or described; and the opinion of those who ought to know about such things and whom I have consulted is that it is a new idea.

* Demonstrated at the meeting of the Harlem Medical Association, June 3, 1908. Reprinted from the Medical Record, October 24, 1908.

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This new way of dropping ether is as follows:

FIG. 1.

1. Make a circular incision through the soft metal cap (Fig. 1, *c*) of the can, as close to the edge of the neck as possible. Extend this about four-fifths of the way around (Fig. 2, *a*), leaving the flat or center portion of the cap (*c*) attached to the neck for the remaining one-fourth or less of its circumference (*b*).

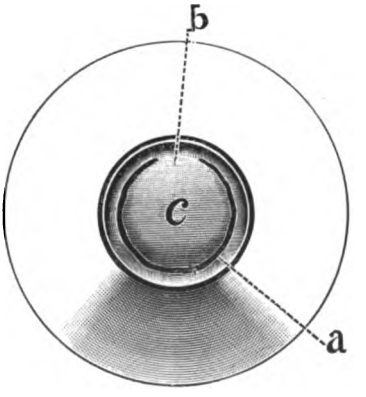

FIG. 2.

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2. Turn this flap (*c*) back, taking care not to detach it or to crack its connection with the outer rim of the cap still attached

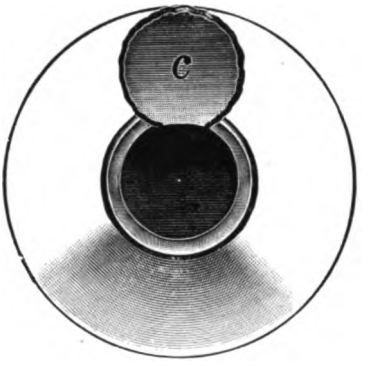

Fig. 3.

to the neck (Fig. 3). The danger of separation is not great, but as this flap will possibly be of use for a second anesthesia, all unnecessary to and fro movement should be avoided.

3. Insert a small pledget of absorbent cotton which has been twisted previously into a sort of wick into the neck and as far up into one angle of the incision as possible, and then turn down the flap (*c*) to its original position (Fig. 4). This will then hold the wick (*d*) tight in the neck.

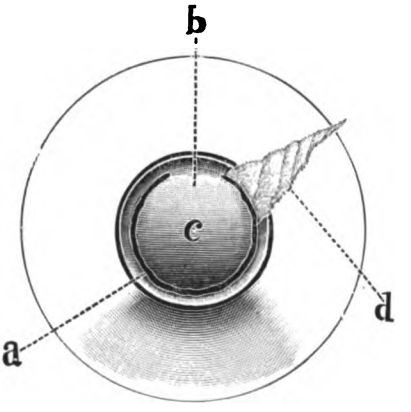

Fig. 4.

4. The can of ether is now ready for use, and if it be tilted, holding it so that the detached side of the flap is uppermost (Fig. 5), drops of ether will fall from the end of the wick,

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rapidly or slowly according as the can is tilted much or little. The size of the drops also can be regulated by manipulation of the wick. If the cotton be twisted to a fine point, the drops will be small. If the end of the wick be made blunt, the drops will be large. If, moreover, it is desirable to pour ether from the can, the top need not be disturbed; simply rotate the can so as to bring the middle part of the incision downward, *i. e.*, the

Fig. 5.

part not plugged by the wick, and when the can is tilted ether will flow out freely.

5. If, after using, some ether remained in the can, the flap (*c*) can be folded back again as in Fig. 3 and a cork put into the neck, which will perfectly prevent the escape of ether from

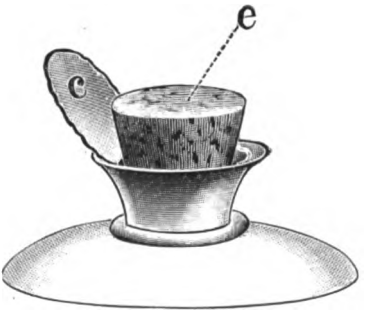

Fig. 6.

the can, yet leave the soft metal cap in a condition for use in a subsequent induction of anesthesia (Fig. 6).

The advantages of this method of dropping ether are availability, simplicity, and cleanliness. It costs nothing, it leaves the purity and strength of the ether undisturbed, and, if it is properly managed, it will not be possible to deluge the mask or the patient's face.

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ORIGINAL CONTRIBUTION.

THE SYMPTOMS OF DISEASE OF THE CEREBELLUM.

By Charles L. Dana, M. D.

Visiting Physician, Bellevue Hospital.

The cerebellum has received much attention recently from anatomists, physiologists and clinicians. As a consequence, some things have been added to the symptomatology of its disease, and it is made probable that this organ takes part in certain functional disorders more often than has been supposed. Hence a summary of the modern symptomatology may be useful. This summary is based on a larger article containing case reports from Bellevue Hospital, published in the *New York Medical Journal,* October, 1906. Several additions have been made in the presentation of the subject here.

There are two groups of cerebellar symptoms: 1, Those due to direct injury or irritation of the cerebellum; 2, those due to increased intracranial pressure, causing general cerebral or local pons-medullary symptoms.

The *direct effects* of lesions of the cerebellum and its afferent and efferent tracts consist of: (1) Ataxic and reeling gait; (2) forced movements and vertigo; (3) cerebellar fits; (4) constrained attitudes; (5) tremors, nystagmus and head oscillations; (6) disorders of segmental peripheral movements of the hands or "asynergy"; (7) sense of weakness and myasthenia, or as it is usually called, parasthenia; (8) hypotonia.

First, and most important of all, as it is the most frequent, is the vertigo. The vertigo that goes with cerebellar disease may be objective or subjective, or both, but the characteristic quality of the vertigo in which the cerebellum itself alone is involved, and not the vestibular or other nerves, seems to be this: The vertigo is a subjective one, and is often not so much a real vertigo as a sense of insecurity and fear of falling. Patients who have this peculiar vertigo are attacked with much the same sensations that one would have if poised on a narrow support over a dangerous abyss. They have a feeling that their sense of

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equilibrium may not be equal to supporting themselves, and there comes a feeling of apprehension along with the distinct sense of inadequacy to keep the equilibrium steady. The patient with ordinary objective vertigo is often content to grasp something and hold the head against the support; but a person with the true subjective cerebellar vertigo seeks at once a place where he can lie down or brace himself. Objects do not whirl around before his eyes, but the floor in front of him seems to move up and down, like the deck of an unsteady ship. This vertigo is particularly apt to disappear when the patient is in a recumbent posture, and to quickly develop when the patient rises or stands. It is accompanied with feelings of weakness and exhaustion also—an acute myasthenia. Ringing in the ears may accompany it, but it is only an incident. There is not apt to be nausea with this form of vertigo, except when it is of very intense degree, when the patients often fall to the ground and lose consciousness.

All these phenomena may occur in very severe cerebellar lesions. In the typical labyrinthine vertigo, however, there is always some objective as well as subjective disturbance, and the patients often make quick, staggering, forced movements, and are more apt to fall to the ground with nausea and faintness. There is also a tremendous amount of tinnitus, and one finds disturbances of the functions of the internal ear.

These attacks of vertigo and disturbance of equilibrium form a kind of cerebellar *petit mal.* But when the cerebellum is subject to severer irritations and trauma, there may result a cerebellar *haut mal,* or cerebellar "fit."

Second: *Cerebellar Fits*—In experiments on animals in which one half the organ is cut away, or the peduncles are cut, striking features are observed. The animal has retraction of the head and opisthotonos, or the trunk is twisted to one side. The limbs on one side are adducted, on the other abducted, there is forcible extension or flexion of the limb, and the animal lies in an awkward, sprawling position. With this there may be clonic movements of the head and eyes, forced rotation of the body, and violent tremors.

These symptoms are rarely seen in ordinary chronic cerebellar disease, but they do occur as an epiphenomenon at the onset of some acute diseases, such as hæmorrhages, and in the course of some chronic disease, such as tumors. In these cases, the patient suddenly has a sense of pain or of rushing of blood

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to the head, with vertigo and roaring noises in the ears, stiffening and irregular tonic spasm of the limbs, the patient lying in a sprawling attitude, such as is seen in animals who have received injuries to the cerebellum. Or the seizure may consist simply of a sudden accession of distress as if the head were struck by a blow, followed by a pitching forward or sinking in a heap to the floor.

I have described these cerebellar seizures as occurring in three groups of diseases: 1, Tumors, especially those of the cerebellar pontine angle; 2, hæmorrhage of the cerebellum directly, and after the clot is absorbed leaving an irritating cicatrix 3, in cerebellar abscess; 4, in primary defects of the cerebellum; 5, in neuropathic constitutions as epileptic equivalents.

Third: The *nystagmus* of cerebellar disease, I cannot say, is always distinctive, but it seems to me that it is usually and rather different from the ordinary nystagmus, due to peripheral and nuclear changes of the oculomotor nerves. It has been found experimentally in animals that in the nystagmus which results from cerebellar injury, the movements are slower to one side than to the other, and that the quicker movements are towards the side of the lesion. This is also the case in some brain tumor cases. The nystagmus is usually not a persistent one, but only brought out by turning the eyes to the side or up and down, and the nystagmus is much more commonly a lateral one.

Fourth: *Oscillatory Movements and Tremors*—Oscillatory movements, which are, perhaps, correlated in character to the nystagmus, occur also in cerebellar lesions. These consist sometimes of a simple lateral oscillation of the head, which may be termed a "lateral head nystagmus," or sometimes a persistent nodding oscillation.

The *tremors* seen in cerebellar disease are not a constant symptom. They appear at times, and may last for weeks or may only occur in connection with vertiginous or more severe attacks. They are seen oftenest in tumors, cerebellar sclerosis and progressive degenerative diseases of the cerebellum. The tremor is coarse and jerky. It is usually more or less intentional in character but may closely resemble the tremor of paralysis agitans.

The nystagmus and head oscillations are really forms of tremor and are the kind seen oftenest. Tremors of the hands and of the face are frequently produced, and very characteristic

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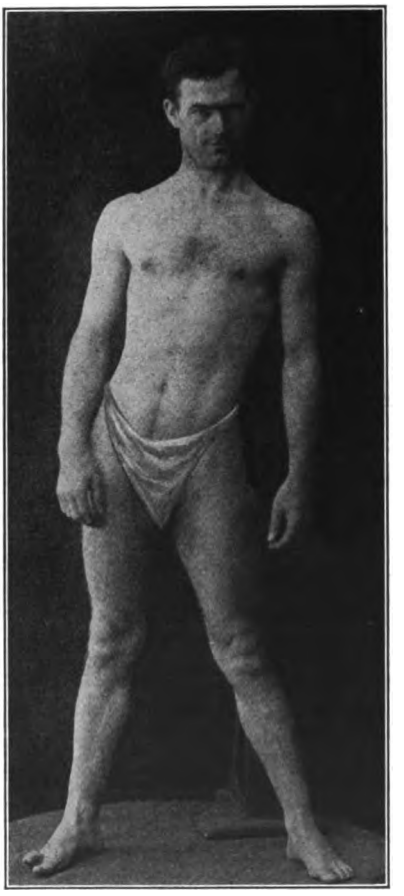
in animal experiments, but are not constantly seen in cerebellar disease in man.

Fifth: The *constrained attitudes* of cerebellar disease are among the most characteristic of the symptoms. In cerebellar tumors these positions most often suggest something of the posi-



Attitude in cerebellar disease (sclerosis).

tion of a person with a wry neck; that is, the head is turned to one side and the chin a little elevated, and the body is sometimes curved away from the side towards which the head is turned. In other cases, the head is held in a rather fixed position, and the trunk is curved laterally, so that the patient stands as if he

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had a pain in the side. In still other cases the patient simply seems to stand in a slouching, lopsided way, which is looked upon by friends as being simply an ungraceful habit of posture.

Sixth: The *muscular weakness,* or "parasthenia," as it is called of cerebellar disease, is a thing about which we have rather few clinical studies. After an attack of a comparatively mild type of vertigo or after an attack of cerebellar vomiting, there is a long period of muscular exhaustion. There occur also in cerebellar disease periods in which the patient seems to be unusually exhausted, drowsy, and when all effort seems to be very difficult. Such patients also are very easily fatigued, because the effort of working the muscles that are not well guided is generally great. Sometimes cases of ordinary "nervous prostration" are probably due to a defective or perhaps originally weak cerebellum. It is much harder to walk a mile, balancing along on a railroad track, than to walk on a straight, broad path, and this, I take it, explains the easy exhaustibility of the muscles in cases where the cerebellum does not properly innervate the system.

Seventh: *Asynergy*—Normally, in extending the arm or leg, the movements of the different segments follow each other in an orderly combination or sequence. In cerebellar disease sometimes these movements are done irregularly and without due harmony and sequence. The result is a symptom called asynergy. It is not, I think, a very common or important symptom.

Eighth: *Hypotonia*—The cerebellum gives a certain degree of tonicity to the voluntary muscles, acting for the body somewhat as the spinal ganglia and afferent nerves do for the different spinal segments. Hence in cerebellar disease there is sometimes noticed a hypotonia of the muscles with loss of patella reflex. This symptom is not uniform because the cerebellum may yet retain considerable functional power.

Ninth: *Gait and Station*—The cerebellar patient has a reeling gait like that of a drunken man in serious cases. But this is not found in smaller lesions. Here we find only a careful gait, the patient taking short steps, and walking with a rather wide base, and inclining to one or the other side. It is especially in the bad labyrinthine irritations that he reels and pitches violently. Sometimes there is a kind of festination or pitching forward as in paralysis agitans, and the patient takes short steps as in an

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exaggeration of the gait of senility. While the cerebellar patient walks unsteadily he generally can stand fairly with his eyes closed, but, unlike the patient in locomotor ataxia, he has sometimes a tendency to pitch backwards or forwards or sideways; more often it is the backward pitch.

These disorders nearly disappear when the patient is in the recumbent posture. Then he moves the limbs and head freely and purposely.

INDIRECT SYMPTOMS.

The cerebellum is enclosed in a tight brain case and, furthermore, is again enclosed in a separate case made by the tentorium above and the pons medulla and fossa of the skull below, with the fourth ventricle between.

When a disease like a tumor or hæmorrhage occurs, there is compression of the cerebellum, the aqueduct of Sylvius connecting the fourth and third ventricles is stopped up, fluid accumulates in the ventricles, the nuclei of the cranial nerves on the floor of the medulla are pressed upon, and we get a great many serious, secondary symptoms; I call these secondary, but they are often early and important symptoms. They consist of mental hebetude, headache, vomiting, optic neuritis, and in the later stages disordered breathing and pulse, and involvement of the oculomotor and other cranial nerves, and retraction of the head. These, however, are all pressure symptoms and not directly cerebellar. They enter into the clinical picture of the disease, but not into the pathology of the cerebellum.

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ORIGINAL CONTRIBUTION.

REPORT OF A CASE OF FAMILY PERIODIC PARALYSIS.

By Charles L. Dana, M. D.
Visiting Physician, Bellevue Hospital.

This history of the case of family periodic paralysis here reported lacks completeness in some ways; but the patient left the hospital and could not be reached again.

The disease, however, is so rare and of so mysterious a character that it seems worth while to publish the records here, as they add at least to the clinical picture of the disease.

Up to ten years ago only three cases of periodic paralysis had been reported in this country, and only twenty-three cases altogether. In 1899 Dr. E. W. Taylor reported two cases occurring in the same family (*Journal of Nervous and Mental Diseases,* September and October, 1899), and in the same year a case was reported by Dr. John K. Mitchell (*American Journal of Medical Sciences,* November, 1899). Since then Crafts has reported a case (*ibid.,* June, 1900), also Putnam (*ibid.,* February, 1900), Mitchell, Flexner and Edsall (Brain, 1902).

In this same year Oddo and Von Audibert collected sixty-four cases (*Arch. Gen. de Médecin*). Cases have been reported since this time by Fuchs and Schlesinger (*Neurolog. Centralb.,* 1905).

The history and bibliography are fully given by Taylor and V. Audibert. The subject of the pathology of the disease is thoroughly discussed by Mitchell and Crafts, and later by H. Douglas, Singer and Goodbody (Brain, 1901), and in the article by Mitchell, Flexner and Edsall.

The disease is usually, but not always, a family one, and has been traced through five generations. Its distinguishing symptoms are periodical attacks of paralysis, lasting from one to seven days, involving the trunk and extremities, but not, or but slightly, the cranial nerves; it is accompanied with loss of all reflexes, except the pupillary, and loss of electrical reaction. There are

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no sensory or sphincter troubles as a rule, and there is a slight relaxation of the heart's muscle. The cause of the disease is unknown, but it is believed to be auto-toxic.

It is, in the writer's opinion, a "migrainous equivalent," the incidence of the periodic insult being on the peripheral motor neurons, instead of on the trigeminal and cervical neurons. It develops in childhood at about the same time as does migraine, and it disappears often at about the climacteric; it is never fatal.

Emil D., age 24, France; waiter; admitted to Bellevue Hospital on June 29, 1906; discharged July 3, 1906.

Diagnosis—Periodic family paralysis.

Family History—Father is alive and well, aged 72 years; had no diseases except rheumatism at 47; was born in Corsica. Mother is alive and well, aged 68 years; had attacks of periodic paralysis from childhood until her sixtieth year. Mother had thirteen children, all of whom are dead except the patient, who was her eighth child; four brothers and seven sisters died in childhood; cause unknown.

One sister died at 38, of abscess of left breast; she had attacks of periodic paralysis from her tenth until her thirtieth year; she had ten children, the condition of whom is unknown.

Paternal grandparents died when middle-aged; cause unknown; were never ill.

Maternal grandfather is alive and well, aged 98 years; has never been ill.

Maternal grandmother died at 86, following fracture of femur (left); she had attacks of periodic paralysis from childhood until her fiftieth year.

Maternal uncle and aunt, aged 45 and 44 respectively, are alive and well; have never been ill.

There is thus a history of four cases occurring in three generations, transmitted on the maternal side. Three were females, one male.

Previous History—He was always healthy until the age of 12 years. No other diseases or former injuries.

Venereal Disease—Denied.

Habits—Tea and coffee at meals, beer moderately, rarely whiskey. Appetite good, eats regularly, sleeps well, bowels regular.

Present History—Was born in Marseilles, France. Always healthy until 12 years of age, when he began having attacks of paralysis. At first the interval between attacks was six months,—as time went on the frequency of attacks increased, until at present the attacks occur every fifteen days. The onset of an attack is always the same and quite characteristic; there is a feeling of numbness in the feet, followed by a slowly progressive paralysis, starting in the feet and extending consecutively into the legs, thighs, abdomen, thorax, hands, forearms, arms and neck. It takes about three hours from the onset, until the paralysis is complete.

Speech and deglutition are somewhat impaired, but become normal in twenty-four hours. An attack lasts from two to three days, with a gradual

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recovery from the paralysis. The muscles of the hands, feet, neck and abdomen, with the diaphragm included, do not show a complete paralysis, but a marked weakness. During an attack he has retention of urine and feces.

Patient entered the hospital in an attack, a few hours after the onset.

Chief Complaint—Recurrent attacks of paralysis; on admission, temperature 98°, pulse 72, respiration 18.

June 30, 1906: Able to slightly move arms and legs; can turn in bed; respirations nearly normal; has control of sphincters; vomited during night; complains of abdominal pains in morning.

July 1: Up in afternoon; rather weak; no abdominal pains.

July 3: Discharged; completely recovered.

General Appearance—Healthy, well developed and nourished young adult; male, of medium stature; thick-set, dark complexion, average intelligence, alert expression; lying in bed helpless.

Eyes—Mobility normal; pupils equal, react normally to light and accommodation; consensual vision normal.

Ears—Normal size and shape. Hearing not impaired.

Face—Negative, *i.e.*, no paralysis.

Mucous Membrane—Red; good color.

Tongue—No deviation when protruded, slightly coated, slightly tremulous.

Throat—Normal.

Heart—Apex in fifth intercostal space, three and one-half inches from median line. Right border at right edge of sternum; left border four inches to the left of the median line; superior border at the third lower rib. Action strong and regular; sounds normal; no thrills or murmurs.

Arteries—Not thickened.

Pulse—Frequency, 72; strong, regular, moderate size, tension somewhat increased. Blood pressure 160 m.m. Janeway apparatus.

Lungs—Impaired expansion, caused by paralysis of the intercostal muscles. Limited excursions of the diaphragm; action weak. Normal respiratory murmur; no râles, dulness or dyspnoea.

Abdomen—Soft, no masses; weak action of abdominal muscles; no abdominal breathing.

Liver and Gall Bladder—Position normal; not enlarged, tender or palpable.

Kidneys—Lower pole of right kidney palpable; neither kidney enlarged or tender.

Skin—Well nourished; good color.

Bones and Joints—Normal.

Muscles—Well developed. No atrophy or fibrillary twitching.

Lymph Nodes—Not palpable.

Sexual Organs—Normal.

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Nervous System—Motor: fingers, flexion feeble; extension feeble; wrists slight flexion, no extension.

Forearms and Arms—Completely paralyzed.

Neck—Slight rotation; no flexion or extension.

Thorax—Complete paralysis of the intercostal and shoulder girdle muscles.

Abdomen—Action of diaphragm and abdominal muscles weak; not completely paralyzed.

Thighs and Legs—No flexion or extension; abduction feeble; adduction feebler.

Feet—Feeble extension; no flexion.

Sensory Anaesthesia—Corneal, conjunctival and pharyngeal anæsthesia; Analgesia, none; Tactile Sense, impaired; Thermal, normal; Muscular and Joint Sense, normal.

Reflexes—Pupillary, normal; corneal, conjunctival, pharyngeal and cremasteric, absent; elbow jerk, wrist jerk, knee jerk, ankle jerk and patella jerk, absent; no clonus; no Babinski.

Trophic—No atrophy of any kind.

Sphincter—Control lost; retention of urine and feces.

Urine—June 30, 1906: Clear, amber colored, acid 1020, alb. trace, sugar 0, no casts.

I am indebted to the house physician, Dr. Robert Milbank, for his careful records of the case.

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CONTRIBUTION TO THE SURGERY OF THE PROSTATE.*

By Samuel Alexander, M. D.,

Professor of Clinical Surgery, Department of Diseases of the Urinary Organs, Cornell University Medical College; Attending Surgeon, Bellevue Hospital.

The mechanism of the urinary incontinence which occurs sometimes after operations upon the prostate is imperfectly understood. This is very largely the result of ignorance of the physiological mechanism which presides over urination. An examination of the various standard works upon medicine and surgery sheds little light upon this subject, but rather adds to the difficulty, owing to the conflicting statements made therein without adequate explanation.

I question very much whether it is possible from our present knowledge to write a strictly accurate description of the complex physiology of the urinary act. It is certain, however, that much of the confusion which now exists can be removed.

I have endeavored in another place to give as clear a description of the physiology of urination as our knowledge of this complex process permits. I purpose in this paper to present some observations in regard to the cause of certain forms of incontinence of urine and to describe a method of treatment which I have employed for its relief and which I think has not heretofore been suggested.

The class of cases to which I desire to call attention are those in which there is a more or less complete inability to retain urine in the bladder owing to partial destruction of the urogenital sphincter, or of its attachments, caused by surgical operation.

During recent years the popularity of prostatectomy in the treatment of obstructive prostatic disease, and the prevailing belief that any surgeon, no matter how limited his experience or knowledge, may perform these operations, has multiplied these cases manifold. I say this advisedly because during the past three

* Read at the Annual Meeting of the American Association of Genito-Urinary Surgeons at Hot Springs, Va., May 1, 1908.

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years more cases of this kind have been admitted into the service under my charge at Bellevue Hospital than heretofore.

These patients were operated upon in other hospitals, and as a result of the manner in which the operations were performed, their condition was made worse, and ultimately they were transferred to Bellevue Hospital. Many of them according to popular standards could be classed only among the hopelessly incurable.

In some of these cases the obstructing portion of the prostate had been only partially removed and sufficient obstruction remained to require a second operation for its removal. In other cases the anterior wall of the rectum had been torn and there was at the time of their admission to the hospital large urethrorectal fistulæ. The perineum in these latter cases was little more than scar tissue owing to ineffectual attempts to repair the damage.

In most of these cases there was a more or less constant leakage of urine either into the rectum or through the perineal fistulæ which remained open or through both. In other cases although the prostate had been removed so much damage had been done to the urogenital sphincter that there was more or less constant dribbling of urine through the urethra.

As most of these patients were advanced in years, weakened physically by disease and by a prolonged convalescence after serious surgical operations, the prospect of any amelioration of their symptoms seemed remote. The treatment of these cases, however, was undertaken, with a determination to spare no time or pains to accomplish a cure.

We may for convenience divide these cases of incontinence into two classes, viz.:

a. Those complicated by urethrorectal fistula.

b. Those not complicated by urethrorectal fistula.

The cause of the urinary incontinence in all of these and similar cases is, I believe, due to more or less destruction of the fibres of the urogenital sphincter muscle, or to a malposition of the attachment of the fibres of parts of this muscle so that they can act only at a disadvantage. The co-ordinate action and reaction which normally exists between the intrinsic muscle of the bladder and the sphincter is therefore disturbed. It will be found that incontinence of urine occurs most frequently when the roof of the prostatic urethra and with it the arch which the urogenital

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sphincter forms in front of the canal is damaged. It occurs also more frequently in those individuals who have naturally a more or less atonic muscular mechanism.

The principle of treatment is:

1. To restore when necessary the perineum, the rectal wall and the urethra to a condition as nearly approaching the normal as possible.

2. To teach the individual by exercise, to use what remains to him of the urogenital sphincter muscle, so that he may acquire voluntary control over the retention and expulsion of urine.

When the control of urination by voluntary effort is attained, automatic control will follow as a physiological necessity.

Any atonic or damaged muscle may be made to act, and the power of its action gradually increased by proper exercises.

It is the method of application of these principles of physiology to the act of urination that constitutes the virtue of our treatment.

The Operative Treatment of Urethrorectal Fistulæ.

The closure of urethrorectal fistulæ is looked upon as one of the most uncertain and unsatisfactory of operative procedures. The difficulty of keeping the line of sutures free from infection and of effectively draining the bladder, make a failure of these operations the rule rather than the exception. It is therefore a satisfaction to be able to report that I have so far overcome the difficulties formerly encountered, that I have been able to close these fistulæ permanently by a single operation, and by methods which while they require experience and careful nursing, can be successfully employed by any competent surgeon.

It is necessary in these cases of urethrorectal fistula following prostatectomy to determine first, whether all obstructing portions of the prostate, especially all intravesical projections, have been removed, and whether the bladder is free from calculi. I mention these facts because I have met with cases in which not only was the prostatectomy incomplete, but in which calculi, and in some instances encysted calculi were found in the bladder.

When these conditions are present they should be removed, and the prostatic urethra and vesical orifice should be made even and smooth to the touch before an attempt is made to close the urethrorectal fistula.

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To close the fistula the patient is prepared by a few days' purgation with castor oil and the bowel is washed out thoroughly at the time of operation.

With the patient in the lithotomy position a curved incision is made in the perineum in front of the anus, extending from one tuberosity of the ischium to the other; the central portion of the perineum is divided and the dissection is carried upward between the rectum and the prostate so as to expose the wall of the rectum externally for at least half an inch above the upper margin of the fistula.

This dissection is to an inexperienced surgeon difficult; for after the prostate has been removed the tissues are very thin between the rectum and the urethra. It will be found that more space in the perineal wound can be obtained by dividing the origin of the transversus perinei muscles from the ischium, or at least the more superficial part of these muscles.

The edges of the fistula should be separated from the urethra by cutting with a sharp knife and scissors and not by blunt dissection. The edges of the urethra at the seat of the fistula should be carefully refreshed by cutting away all overgrowing mucous membrane from the urethra, but the urethra should not be sutured.

The tissues about the fistulous opening in the rectal wall are then refreshed with curved scissors and made smooth. All hemorrhage should be stopped and the wound made as dry as possible. The opening in the rectal wall is then closed by interrupted Lembert sutures of chromicized catgut placed from the perineal side by means of a round curved needle. These sutures should not include the mucous membrane of the bowel. One suture should be placed well above the upper margin of the opening and one well below the lower margin. It will be found convenient to introduce the sutures from below upward, and not to tie any suture until all have been placed.

After the opening into the rectum has been closed the bladder and bowel are to be irrigated by means of a metal tube. During this process the bowel should not be distended. No drainage tube is put into the bladder.

To protect the line of suture in the rectal wall I have devised the following expedient: A small triangle of gauze consisting of six or eight layers is made to fit the wound. The apex of this triangle is carried by forceps up to and behind the vesical orifice.

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Between the layers of gauze a 10 per cent. iodoform ointment, made with vaseline, is then injected from a glass syringe between the layers of the gauze and the little pad is then plastered down so as to fit the posterior surface of the perineal wound accurately.

As the urine flows from the bladder over this pad it is shed off this as water is from a duck's back.

The gauze is to be changed twice or three times a day, or oftener if the pad becomes displaced.

The external wound is then dressed by gauze pads to absorb the urine as it flows out of the wound.

I have usually confined the bowels by the use of opium for one week, and have then given a dose of castor oil and have superintended the giving of an enema at the time of the first movement.

On each day during the first week I introduce into the rectum a metal tube and wash out the lower bowel without distending it, and then inject into the rectum about one or two drachms of iodoform ointment. I am now able uniformly to get solid union of these fistulæ. It requires, however, attention to minute details and good nursing and careful watching. The results are a full compensation for the work.

The perineal wound is given the most careful attention during cicatrization so that it will fill in from the bottom without fistula. Sounds are passed after the first ten days as they may may be required to keep the urethra free from stricture and to make its walls smooth.

The Restoration of Voluntary Control of the Urogenital Sphincter.

After restoration of the rectal wall and of the perineum these cases of urinary incontinence come into the second division of our classification and are to be treated as the cases of incontinence not complicated by urethrorectal fistula.

Every surgeon who has had extensive experience in the performance of prostatectomy has encountered these cases, and the occurrence of this disability has frequently been presented as an argument against the operation. Happily the great majority of cases of prostatectomy skillfully done do not suffer from this disability. But there is a sufficiently large minority that does so suffer and so far as I know no adequate method of treatment has heretofore been suggested.

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The method which I now present has had an extensive trial during more than three years and the results which have been obtained have justified our most sanguine expectations.

I had the honor to show to the Society of Clinical Surgery at their meeting in New York last October a large number of the cases which form the basis of this paper, and give a practical demonstration of the method of treatment by which these patients had been cured.

This inability to retain the urine as I have said may be more or less complete and I have seen the following different degrees:

1. There may be what is practically if not literally a complete incontinence. The action of the urogenital sphincter seems to be abolished and the urine almost as fast as it flows from the ureters into the bladder, flows out through the urethra, drop by drop. The flow is usually intermittent, and corresponds to the intermittent flow from the ureters.

2. The bladder may be able to retain a small quantity of urine, but when this amount is exceeded there is leakage.

3. The leakage may be intermittent, occurring at certain times during the day. There is often no leakage during sleep, nor for several hours after rising in the morning, but toward evening when the patient becomes physically tired, there is more or less incontinence.

4. The patient may have perfect control while sitting or lying down, but when standing or walking, there is involuntary leakage.

5. There may be leakage immediately after the urinary act, caused by retained urine in the urethra as the result of an atonic condition of the urethral walls.

These different degrees of disability are subject to infinite variation.

The effect of this inability to retain the urine, upon the minds of men naturally feeble, or made feeble by sickness and by disappointment, is often lamentable. And it is very necessary to arouse in the minds of these patients the hope that their disability is not a permanent one. The influence of suggestion here is undoubtedly great, and no time or pains should be spared to impress them with the reasonableness of a promise to cure them. This is essential, because without the hearty and intelligent cooperation of the individual patient a cure is impossible. On this

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account and to accomplish the best results, I have adopted the plan of treating several patients together in the hospital; so that those who are beginning to be taught to gain urinary control may be encouraged by those who have been taught, or who are at least further advanced toward a cure than they themselves are.

The method of instruction must vary with each case, but a general idea of the plan pursued in most cases may be given in outline.

The principle of treatment is to make the individual learn by practice to exercise voluntary control over what remains of the urogenital sphincter, thus to prevent the escape of urine. If this can be done, automatic control follows as a physiological necessity.

The difficulties to be overcome are greater than they might at first seem because in some of these cases there has been a very extensive destruction of the urogenital sphincter, by the improper performance of the prostatectomy. Yet even in the seemingly hopeless cases it is surprising to find how readily the parts remaining of this complex muscular mechanism which we call the urogenital sphincter may be trained to compensatory work.

The first step in accomplishing this result is to accustom the individual to moderate bladder distention. A catheter is introduced through the urethra and a warm saline solution is injected. The quantity injected should be just short of that sufficient to excite vesical contraction and a desire to pass urine. The catheter is then closed by the finger and the individual is instructed and urged to exert himself to retain his urine; this is continued for several minutes; then continuing to urge the patient to "hold his water" the catheter is withdrawn. The fluid from this bladder is usually at first expelled, but the patient is urged during the entire time to prevent its escape.

This procedure is repeated several times and with varying quantities of fluid.

After a few days it will be found that the ability to retain some of the fluid injected is acquired. This fact should be pointed out to the patient and he should be encouraged in his efforts. He should be instructed to make voluntary effort to control the escape of urine whenever he can.

After he has acquired the ability to control the injected fluid in the recumbent position, he is taught to control it when moving, when getting out of bed, when sitting down and when per-

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forming certain mild calisthenic exercises, as raising first one foot, then the other foot; sitting down and then arising. These actions are at first done with deliberation, then more rapidly.

In order to prevent leakage it is important to see that the urethra is completely emptied after each act of urination. In old men whose muscular structures are relaxed, or in whom the accelerator urinæ muscle has been injured the urethra does not empty itself and the presence of urine in the canal excites the contractility of the bladder and causes dribbling of urine. The patient is instructed to press upon the perineum with the fingers and to strip the urethra after each act of urination.

As soon as he has acquired any voluntary control, he should be instructed to urinate at frequent intervals and each act of urination should consist of an exercise of interrupted urination, viz., to begin the act, to cut off the flow; to begin again, to control the flow.

At first all of these exercises must be done under supervision; and the rapidity with which the results are obtained will depend in a measure upon the intelligence of the individual and his co-operation in the treatment. An ignorant, discouraged, sulky old man is hard to teach; but it can be done if one gives the time and energy necessary.

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CONTRIBUTION TO THE SURGERY OF THE PROSTATE.*—PROSTATECTOMY IN THE TREATMENT OF PROSTATIC ABSCESS OF GONORRHEAL ORIGIN.

By Samuel Alexander, M. D.,

Professor of Clinical Surgery, Department of Diseases of the Urinary Organs, Cornell University Medical College; Attending Surgeon, Bellevue Hospital.

In an article upon "Prostatic and Periprostatic Abscess," read before the New York Surgical Society in October, 1904, and published in the *Annals of Surgery,* Vol. xli, 1905, I gave the views I then held upon the pathology of prostatic and periprostatic suppurations, and described a method of operative treatment which I had employed for several years for the relief of these conditions. In a subsequent article, entitled, "Observations upon the Cause and Treatment of Perineal Abscess, and of Peri-urethral Suppurations above the Triangular Ligament," read at the Montreal meeting of the American Association of Genito-Urinary Surgeons in June, 1905, and published in the *New York Medical Record,* October 28, 1905, I called attention to the fact that perineal and ischiorectal abscess is usually associated with peri-urethral suppurations above the triangular ligament, either in the form of prostatic abscess, suppurative Littritis or suppurative Cowperitis.

In the paper upon "Prostatic and Periprostatic Abcess" I said, in regard to treatment: "I treat all forms of prostatic abscess by opening them into the prostatic urethra through a median perineal incision, whether the pus is confined within the capsule or has extended outside the capsule; whether it is above the triangular ligament or has extended into the perineum or into the ischiorectal fossa.

"The technic of the operation is simple. The patient is placed in the lithotomy position; the membranous urethra is

* Read at the Spring Meeting of the New England Branch of the American Urological Association, Boston, May 12, 1908.

Reprinted from the Boston Medical and Surgical Journal, 1908, CLIX., 605.

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opened upon a staff; the prostatic urethra is dilated and explored by the finger; a finger of the other hand is passed into the rectum, and between the two fingers the extent of the abscess cavity can be defined. It is easy to appreciate by the sense of touch the part of the prostatic urethra over the abscess cavity, and the openings when the abscess has discharged spontaneously into the urethra can be felt easily. The abscess is opened by tearing with the finger through the mucous membrane; its cavity is explored, any fibrous bands which traverse it are broken down, its floor is made level with the floor of the urethra, and the opening in the urethral wall is enlarged sufficiently to insure thorough drainage. This is done entirely with the finger; to do it efficiently requires experience; rough and unskillful manipulation may cause severe hemorrhage. A catheter, No. 28 F. or No. 30 F., is introduced through the perineal wound into the bladder and is retained by tapes fastened to a waistband. One or two strips of gauze are passed alongside of the tube to the edge of the abscess cavity, but the latter is not packed. The tube and gauze I remove on the third day, sometimes on the second. The case is then treated as a perineal section."

This method of treatment was based upon the conception which I then had of the pathological anatomy of prostatic suppurations, gained from clinical observation of a large number of cases, and the examination of a number of pathological post-mortem specimens. I summarized my opinion as follows (p. 884):

"Prostatic abscess usually begins by the extension of an infection from the urethra into the gland ducts of the prostate. The infection sometimes may occur through a wound in the surface of the prostatic urethra, but infection through the gland ducts is more common. The suppuration may be confined to one or more of the excretory ducts, or the infection may extend into the alveoli and involve one or more of the prostatic lobules, and by extension it may destroy more or less of the entire gland.

"Each lobule of the prostate is composed of a number of tubular glands; the excretory ducts from these empty into the urethra on each side of the verumontanum. The excretory ducts are formed by the union of smaller ducts, and these latter communicate with the terminal gland alveoli. The secretion from the alveoli in each lobule is discharged into the urethra through one excretory duct. Infection, therefore, of a single duct should

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affect the tubes and alveoli in only one lobule, but when there is infection of more than one duct the foci of suppuration are multiplied, and these different foci frequently open into each other and form a single abscess.

"When an infection from the posterior urethra extends into the prostatic ducts, and preceding the formation of an abscess, there is an increase in the size of the prostate. This is caused by retention of the secretion in the alveoli communicating with the infected ducts which are obstructed by the swelling of the mucous membrane of the urethra and by an accumulation of inflammatory exudate. The gland tubes and alveoli are distended and impede by pressure the circulation in the veins. This edema of the prostate is increased by anything which increases the congestion, as, for example, by the frequency of urination and the straining to empty the bladder which are so characteristic of cases of acute prostatitis. This swelling of the prostate caused by retention of the secretion in the glands and by edema may subside without the formation of an abscess. The excretory ducts discharge the secretions into the urethra, the obstruction to the venous circulation is thus relieved and the swelling of the prostate subsides; or small abscesses may occur and open into the urethra and may thoroughly discharge their contents; but a small abscess which has opened into the urethra by an opening too small to efficiently drain it may be the source of great distress and annoyance to the patient. A persistent urethral discharge which relapses frequently is due often to this cause and there is always danger of recurrence or of an extension of the infection. Many cases of relapsing posterior urethritis, and many which are called chronic follicular prostatitis, are really cases of imperfectly drained prostatic abscess. A prostatic abscess may be confined within the capsule for a long time, sometimes for several weeks, without opening into the urethra. An abscess freely drained by a large natural opening into the urethra often may heal without operation, but abscesses of the prostate which open into the urethra spontaneously often require operation.

"Le Dentu's statement that abscesses of the prostate which open spontaneously into the urethra do so by openings proportionate to the size of the abscess cavity is contrary to my experience. Therefore, when an abscess of the prostate opens into the urethra spontaneously, an operation is required unless the drainage is efficient."

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This method of treatment by perineal incision and drainage I continued to employ from 1900 until the close of 1905. The results which we obtained were most satisfactory in some cases, but in others, although the acute condition caused by the abscesses was relieved and the perineal wounds healed rapidly, there were a considerable number of cases which continued to have, even after operation, a persistent urethral discharge, and in a few cases patients returned after several months with another abscess in the prostate, necessitating a second operation through the perineum.

I therefore formed the opinion that either our technic was deficient, and that we did not efficiently drain the prostate, or that our views in regard to the pathological anatomy of prostatic suppurations were imperfect.

We made such changes in technic as seemed necessary, but the difficulty of gaining accurate data upon which to reconstruct our pathological anatomy was caused by the impossibility of collecting post-mortem specimens which would show the different stages of prostatic suppurations.

I had observed that in many of the post-mortem specimens of advanced prostatic suppuration which I had examined the prostate was the seat of multiple abscesses and that it would have been impossible by any operation to effectively open and drain all of these foci. The necessity of removing the diseased tissue *en masse* seemed clear. I began, therefore, to treat cases of prostatic abscess by prostatectomy performed through a median perineal incision, enucleating the lateral lobes through the wall of the prostatic urethra, a procedure identical to that which I have consistently employed in the treatment of prostatic enlargement since 1894.

I was further encouraged to do this because in several cases of prostatic abscess operated by perineal section and drainage I had found one or the other of the lateral lobes dissected almost free by the suppurative process, and in one or two of these cases I had been obliged to remove this loosened portion of the prostate.

This method of operative treatment by prostatectomy, the details of which I shall later describe, I have employed in many cases of prostatic abscess during the past four years.

We have operated upon a variety of abscess conditions, some in patients with prostatic enlargement, others in patients with

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urogenital tuberculosis, others in cases of long-standing filiform stricture, etc.; but the majority of operations have been upon patients with gonorrheal infection of the urethra, and as these cases differ in important particulars, both clinically and pathologically, from the others, I shall consider in this paper only this latter class, viz., *suppurative process in the prostate which occur during the course of and as the result of gonorrheal urethral infection.* I have taken for a basis of this report only those cases operated upon in my service at Bellevue Hospital, because all of these patients have been treated under the same conditions. The operations have been performed in a public clinic, and the histories of all these cases are a matter of public record. In estimating the results of any operation, the general physical condition of the patients should also be considered. The patients at Bellevue Hospital are all charity patients; they come from the very poor of the community and are, as a rule, insufficiently nourished, poorly housed, and many of them have no permanent homes.

The following table will show the number of cases of prostatic abscess of gonorrheal origin operated upon during the years 1905, 1906, 1907, and during the two months (January and February), 1908, either by perineal section and drainage or by prostatectomy. The number of cases by each operation are arranged in parallel columns:

TABLE I.

CASES OF PROSTATIC ABSCESS OCCURRING DURING THE COURSE OF AND AS THE RESULT OF GONORRHEAL INFECTION OF THE URETHRA.

Treated at Bellevue Hospital. Dr. Alexander's Service.

PERINEAL SECTION AND DRAINAGE.		PROSTATECTOMY.	
Year.	No. of Cases.	Year.	No. of Cases.
1905	12 cases.	1905	2 cases.
1906	6 "	1906	13 "
1907	2 "	1907	17 "
1908 (Jan. Feb.)	3 "	1908 (Jan. Feb. Mar.)	4 "
	23 cases		36 cases

Total number of cases of prostatic abscess, 59.

This gives as a basis for comparison twenty-three cases of prostatic abscess treated by perineal section and drainage, and

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thirty-six cases of prostatic abscess treated by prostatectomy, a total of fifty-nine cases of prostatic abscess.

The ages of the fifty-nine patients subjected to these two methods of operation have been arranged in Table II:

It will be seen by reference to this table that nearly all of these patients were young men. Thirty-four cases, or nearly one-half the entire number, were between the ages of 18 years and 25; and nineteen cases, or one-third of the patients, were between the ages of 25 years and 30. Therefore, forty-five cases, or nearly three-fourths of the entire number, were under 30 years of age.

TABLE II.

PERINEAL SECTION AND DRAINAGE.		PROSTATECTOMY.	
Ages of Patients.	Cases.	Ages of Patients.	Cases.
Between 18-25 years,	10	Between 20-25 years,	14
" 25-30 "	6	" 25-30 "	13
" 30-35 "	4	" 30-35 "	7
" 35-40 "	1	" 35-40 "	0
" 40-44 "	2	" 40-43 "	2
	Total, 23		Total, 36
Youngest patient,	18 years	Youngest patient,	20 years.
Oldest "	44 "	Oldest "	43 "

The prostatic abscess in these cases occurred during that period of life in which gonorrheal infection of the urethra is most common, and this fact, taken with the history of the urethral infections, is evidence that gonorrhea was the causative factor in the production of the prostatic suppuration.

Continuing the analysis of these cases, it is interesting to note the time at which prostatic abscess developed in the course of the gonorrheal infection. This is shown in the following table:

TABLE III.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
Abscess occurred during first gonorrheal infection.....	10	16
Abscess occurred after two or more previous attacks of urethritis which were cured (?).....	5	2
Abscess occurred in cases of relapsing urethritis in.....	8	18

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It should be noticed that the prostatic abscess developed during the course of a first urethral infection twenty-six times, or in nearly one-half the cases; in seven cases the patients had had two or more new infections of the urethra preceding the abscess and had been pronounced cured of their infections.

Twenty-six, or nearly one-half of the entire number, had had relapsing urethral discharge for varying periods, and in some of these cases there was a history of symptoms of previous prostatic suppuration.

Table IV. shows the frequency of perineal and ischiorectal abscess, associated with prostatic suppuration:

TABLE IV.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
Prostatic abscess was associated with perineal abscess in.....	7	7
With ischiorectal abscess in.....	1	4

It will be noted that perineal abscess usually arising from a coexisting Cowperitis or bulbitis or from the extension of periprostatic suppuration was present in fourteen cases. In five cases there were complicating ischiorectal abscesses of prostatic origin. The number of ischiorectal infections in this series of cases is below the average, and is due to the fact that in many of the cases of prostatic abscess early operation was performed. I am convinced that nearly, if not all, ischiorectal abscesses which come under the observation of the genito-urinary surgeon are of prostatic origin, and that the reason so many ischiorectal abscesses relapse (which they certainly do), after treatment by simple incision and drainage is because the prostatic origin of the infection is overlooked. To cure these ischiorectal abscesses the origin and source of the infection must be removed.

Table V. shows the proportion of cases in which there was marked urethral stricture:

TABLE V.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
With urethral stricture.....	3	6

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There were only three cases of stricture properly so called, but a very large number of the cases showed a congenitally narrow external urethral meatus necessitating meatotomy, and this fact should not be lost sight of as a contributing causative factor in the production of prostatic abscess. I believe that imperfect drainage of the urethra caused by this defect may play a not unimportant rôle in causing many of the complications incident to gonorrhea.

The operations, whether of perineal section and drainage, or of prostatectomy, were performed usually within twenty-four hours after the patient was admitted to the hospital. The most varied anatomical conditions as to size and extent of the lesions were found at operation.

Table VI. shows the proportion of cases in which the suppuration was confined within the limits of the capsule, and those in which there was an extension of suppuration outside the capsule—periprostatic abscess:

TABLE VI.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
Pus confined within the prostatic capsule	15	22
Pus had extended outside capsule....	8	14
Abscess had opened into rectum....	1	0

It will be noted that of the fifty-nine cases, in thirty-seven the pus was contained within the capsule, while in twenty-two cases there was periprostatic suppuration. In many cases one or more abscesses had ruptured into the urethra either before or at the time of operation, but in all of these cases other foci of suppuration which had not opened into the urethra were found in the portions of the prostate removed. A number of the patients had acute epididymitis at the time of admission, and several of these were admitted to the hospital with this diagnosis. The prostatic condition was found at the time of their examination.

SYMPTOMATOLOGY.

An analytical study of the symptoms and physical signs in this series of cases is of interest and leads to conclusions in some respects at variance with the usual descriptions of prostatic abscess. As I shall presently show, prostatic abscess presents great variety in its pathology and pathological anatomy. The lesions which are

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present are not always the same. The number of suppurating foci varies; the size of the abscesses vary from multiple miliary necrotic areas to collections of pus which occupy the greater part of one or the other of the lateral lobes. The abscesses may be situated near the urethra or in the centre or near the periphery of the lobe.

The infective agent is not always the same and the toxic power of this agent and the resistance of the individual patient seems to be subject to great variations.

In view of these facts it is natural that the subjective symptoms and the degree of constitutional disturbance due to septic absorption should be subject to like variation.

We may for convenience consider these symptoms under the following heads:

1. Retention of urine.
2. Pain and frequent urination.
3. Purulent discharge.
4. Blood.
5. Constitutional symptom of sepsis.

TABLE VII.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
Abscess caused complete retention of urine in.....	13	18

(1) *Retention of Urine*—Of the fifty-nine cases of prostatic abscess, thirty-one cases, or more than 50 per cent., had retention of urine. In the majority of these cases the retention was complete. In a few cases the patients were able to void a little urine at frequent intervals, but in all of the thirty-one cases the bladder was over-distended.

The retention was usually preceded for several days by frequent and painful attempts to urinate, the retention gradually increasing. In a number of cases there was a marked atony of the bladder, and when this was present the frequency of the desire to urinate lessened and the pain was diminished. In cases in which the retention of urine had continued for several days, and had been only partially relieved by catheter, there was involuntary dribbling of urine from vesical distention and overflow.

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(2) *Pain*—Pain was a frequent but not invariable symptom. The painful sensations were of two kinds: (1) Pain associated with the act of urination; (2) pain not associated with urination.

In the cases of retention of urine there had been or was at the time of admission to the hospital pain associated with the act of urination. In many cases there had been or was pain and tenesmus at the time of urination. Pain and a sensation of weight in the perineum was a frequent symptom, and this was intensified in the cases associated with perineal abscess. Pain in the rectum was one of the more constant symptoms, and this was intensified upon defecation.

In many cases, especially in those with retention of urine, the rectal pain was intensified by the presence of hemorrhoids. There was marked pain and tenderness in the ischiorectal region in many cases, and this frequently was present when no evidence of ischiorectal infection could be discovered. I believe that if the cases in which this symptom was present had not been promptly relieved by operation there would have developed abscesses in the ischiorectal region as the result of infection from the prostate.

(3) *Purulent Discharge*—In the cases in which an abscess had opened into the urethra there was usually a very profuse discharge of pus from the meatus. When this occurred in cases of retention of urine, the last part of the urine drawn by catheter resembled pure pus.

(4) *Blood*—In not a few cases there was noticed a discharge of blood from the urethra at the termination of the urinary act, but this was by no means a constant symptom.

The discharge of blood and pus not infrequently occurred during the preliminary rectal examination of patients caused by the mechanical rupture of an abscess into the urethra.

(5) *Constitutional Symptoms of Sepsis*—Chills and fever caused by septic absorption were very marked symptoms in a few cases, but in the majority of cases no history of chill could be obtained, and the febrile rise did not in most cases exceed 100 degrees F. or 101 degrees F., and frequently the temperature was normal. It was a striking fact that in many cases after the initial rise in the temperature there was a return to normal, and had it not been for the physical examination of the prostate, the presence of extensive suppurative processes might have been overlooked.

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Speaking generally, I should say that the symptoms in many of the cases in this series were often less severe than might be expected from the descriptions usually given by most authors.

Physical Signs—The spontaneous opening of a prostatic abscess into the urethra is accompanied by an unusual flow of pus, the quantity depending upon the size of the abscess and the size of the opening. The pus appears at the meatus and also flows backwards into the bladder and then appears with the last urine passed at each urination. In these cases, when the drainage is imperfect, this symptom persists. When the drainage is efficient the quantity of pus rapidly diminishes, and this is associated with a diminution in the intensity of all the other symptoms.

Abscess of the prostate is often ruptured into the urethra during the rectal examination incident to diagnosis. In some cases slight pressure upon the prostate causes a flow of pus from the meatus. An abscess frequently is ruptured into the urethra during catheterism practised for the relief of the retention of urine.

The symptoms of pain and retention are sometimes relieved when the pus from the prostatic abscess extends outside the capsule.

An examination by rectal touch is necessary to a positive diagnosis of prostatic abscess, and this always should be combined with counter-pressure, first over the pubes and then upon the perineum. In the earlier stages of abscess it is impossible always to distinguish between the congestion and edema of acute prostatitis and that of abscess, but I believe that acute prostatitis without suppuration is rare when the symptoms have existed for more than a few days and when there is complete or partial retention of urine. In an abscess confined to one side of the prostate, the affected lobe is usually more swollen than the other. Fluctuation or a point of softening is present in many cases, but unless the abscess is large and the pus near the posterior surface of the gland, distinct fluctuation cannot always be detected by rectal touch. If one waits for fluctuation before operating, much valuable time will be lost and important structures destroyed. I have found extensive abscess of the prostate in cases in which by rectal touch I had failed to find fluctuation.

The outline of the prostate in cases of abscess is sometimes obscured by edema of the tissues in the anterior wall of the rectum. This is true especially in cases of periprostatic suppura-

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tion and in cases of prostatic abscess associated with suppuration about the membranous urethra.

In most cases of prostatic abscess I have found that the urine contains a larger percentage of albumen than can be accounted for by the pus. This symptom is one to which I attach considerable importance in doubtful cases. The albumen seems to be the result of an acute inflammatory edema, the serum escaping into the urethra.

Abscess of the prostate should be recognized and operation performed before the pus has extended beyond the capsule, and, when possible, before the abscess has opened into the urethra. I am convinced that I have shortened the duration of the disease by operating before the signs of fluctuation could be detected by rectal examination, and in all of these cases I never have failed to find one in which there was not suppuration.

An operation is indicated at the earliest possible moment unless the abscess has opened into the urethra, but in many cases in which this has occurred I believe an operation will hasten the recovery. An abscess which has opened into the urethra by a small opening requires operation quite as much as one which has not opened into the urethra. A periprostatic abscess always requires operation.

The removal of these diseased and suppurating prostates, comprised in this series of 36 prostatectomies and a large number of private cases not included in this series, has given me a very valuable collection of pathological material for the study of prostatic infections. This material could have been secured in no other way than by prostatectomy operations upon these patients. I believe that I state no more than the truth when I say that the value of these specimens in adding to our knowledge of the suppurative lesions of the prostate cannot be overestimated, and that the collection of these prostates, both in their number and the character of the lesions which they show, is unique.

The study of all of these specimens is not complete, and at the present time I can give only a general description of the results which we have obtained.

The method of study which has been employed has been:

1. To note the gross appearance of the lesions at the time of removal.

2. To submit the specimens to the examination of the Pathological Department of Cornell University. The histological ex-

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aminations have been made by Dr. James Ewing, Professor of Pathology, Prof. T. W. Hastings, and by Dr. Mortimer Warren, of the Department of Clinical Pathology. Reports of these cases have been sent to me, and these have been compared with the clinical findings in each case. I desire to express my great obligation and thanks to these gentlemen for their painstaking work, and for the valuable criticisms which they have made as the work has progressed.

I may state in general that so far as our investigations go, the views which I expressed as to the pathology of prostatic abscess in 1904, and to which I have alluded in the opening part of this paper, have been confirmed as far as they went, but we have found in addition that in abscess of the prostate there is present every degree of the inflammatory process, and at my request Dr. Ewing has sent me a general description of these lesions made from a review of the cases which we have examined up to the present time, and of which I give the full text:

"The general impression one may draw from a review of these specimens is that one is dealing with the results of bacterial invasion through the ducts and extending throughout the stroma of the gland. Additional infection through blood vessels or lymphatics need not be excluded.

"'It is possible to group the lesions in three classes as follows:

"'1. A purulent catarrhal process with exudate chiefly or wholly within the tubules.

"'2. An interstitial purulent process starting from the tubules, invading the surrounding stroma, destroying the tubules and forming miliary or larger abscesses. There were many grades of intensity of this inflammation, but the less severe grades were the more frequent, and mononuclear and eosinophile cells were commonly abundant, indicating a subacute rather than an acute process.

"'3. Chronic exudation and productive processes. These resulted in infiltration of the stroma, especially about the tubules, with mononuclear cells, the appearance of compact foci of lymphocytes, chronic edema, areas of softening composed of leucocytes, swollen degenerated epithelial cells and other fixed tissue elements, and occasionally of advanced hypertrophy and metaplasia of the tubule cells.

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"'While some areas showed in rather pure form each of these types of change, the lesions were usually combined, each case showing in different portions of the prostate all three stages of the process.'

"Regarding the possibility of spontaneous regression of the inflammatory process observed, I am unable to form a satisfactory opinion since the result must depend on the anatomical position of the tissue and the character of the infection. Clinical observation seems to me the only method of determining this question.

"Judging from the histology, while in some of the cases there appeared to be no irremediable damage to the prostate, as in the catarrhal cases, in many others there was extensive destruction of tissue, from which complete restitution under any conditions was impossible. When marked, metaplasia of the tubule cells seen in some cases suggests a relation of this chronic inflammatory process to carcinoma of the prostate."

It is as a result of my own clinical observation and of the pathological reports upon this series of cases that I justify the removal of these prostates as a method of treatment necessitated by the pathology of the disease and the ultimate clinical results in the patients operated upon.

The Operation.

The membranous urethra is opened by a median perineal incision. The floor of the membranous urethra is cut from the buib to the apex of the prostate. The prostatic urethra is dilated by passing the index finger through the wound and into the bladder. During this procedure the mucous membrane of the prostatic urethra, and in some instances the prostate itself, is split and an abscess is opened into the urethra. The wall of the prostatic urethra is then examined by touch. The opening of any abscess can be thus detected. The lateral lobes are then enucleated, separately, by breaking through the mucous membrane of the prostatic urethra with the finger. The "line or cleavage" is followed and the lobe is separated from the bladder wall. The middle isthmus of the prostate is broken at its junction with the lateral lobe. The lateral lobe is then free and is delivered through the perineal wound by means of a small lithotomy forceps.

The operation to an experienced hand is as easy as when the prostate is enlarged. But as in prostatectomy for enlarged pros-

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tate, the operation requires an accurate touch and a thorough and practical anatomical knowledge.

After the lateral lobes have been removed, the vesical orifice can be felt as a distinct ring which fits the end of the examining index finger. The hemorrhage is never very severe. To control this, I have adopted the following device: I introduce the finger into the perineal wound and hook the end of it over the edge of the lower lip of the vesical orifice. A pair of flat forceps with a lock in the handle is then passed underneath the finger and the lower lip of the vesical orifice seized and the forceps locked; the finger is then withdrawn and gentle traction is made upon the forceps. This draws the vesical orifice toward the perineum and compresses the prostatic plexus and causes almost complete cessation of the hemorrhage. The bladder is then emptied of any clots it may contain and irrigated. The bladder is drained by a metal perineal tube, 8 inches long and having upon the shaft a round diaphragm which, by means of a spring attachment, can be slid along the shaft of the tube, and will remain fixed where it is placed.

The tube I have employed is simply one of the straight Bigelow evacuating tubes, cut off to the proper length and fitted with the diaphragm. The tube is put in place without the diaphragm, and the wound is packed with strips of folded iodoform gauze by means of long forceps. It is important to put this packing in accurately, and during the packing gentle traction is made upon the forceps. In this way the packing makes pressure upon the edges of the vesical orifice and counter pressure is made by traction with the forceps. The hemorrhage is thus efficiently controlled. The forceps are then removed.

Long strips of folded gauze are then wrapped loosely about the tube as it emerges from the wound, so as to form a cushion; this should be thick enough to bring the surface of the cushion level with the tuberosities of the ischium. The diaphragm is then put upon the tube and pushed firmly down upon this perineal cushion of gauze.

A piece of rubber tubing four inches long is then put upon the end of the tube. The tube is held firmly in place and the dressings are applied and held in place by means of a three-tail perineal bandage which was devised by Dr. Herrick, a former house officer in my service at Bellevue Hospital. The outer tails of this bandage cross one another in the perineum, and the middle

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tail, which is split for the passage of the tube, is brought firmly over these and fastened in the middle line.

The patient is put to bed and simple syphon attachment made to the tube. With the dressing properly in place the patient may turn upon his side. There is practically no leakage along the tube. The dressing remains dry and the tube causes little discomfort.

The perineal tube is removed on the day following the operation. The packing is removed at the same time or on the day following, and the wound is then treated as a perineal section.

There was in most cases a rise in temperature of from 2 to 3 degrees on the day following the operation, but this fever subsided promptly.

The bladder was washed out daily for three or four days through a catheter passed through the perineum. After this a silk coude catheter could be introduced into the bladder through the urethra.

In acute cases of gonorrhea, or in those in which the urethral discharge was profuse, we began the treatment of the anterior urethra at once by injections of a 10-20 per cent. solution of argyrol. These injections were given once or twice in twenty-four hours.

A sound, No. 24 F. or No. 26 F., was passed on the fifth or sixth day after operation and again at the end of the second week; this was done to insure the smooth healing of the prostatic urethra.

The perineal wound often does not close as rapidly as do the simple perineal sections. All urine is usually voided by urethra at the end of the second week. The perineum should be solidly closed in from four to five weeks. After the wound is closed, the deep urethra should be treated by instillations of 10 per cent. argyrol once or twice a week.

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The following is a brief account of the post-operative complications in the cases treated by prostatectomy:

TABLE VIII.

POST-OPERATIVE COMPLICATIONS.

	Perineal Section and Drainage. Cases.	Prostatectomy. Cases.
Epididymitis (unilateral).....	8	12
Epididymitis (bilateral).....	3	2
	11	14
Abscess of epididymis and suppurative vaginitis.....	0	3

Epididymitis—Fourteen cases developed post-operative epididymitis; there did not seem to be any rule as to the time which this complication occurred. The shortest time was the fourth day; the longest was the forty-fifth day.

In three of these cases the epididymis suppurated and there was a concomitant suppurative vaginitis.

In one case the testes was so diseased as to require castration. In another, the globus minor was removed.

In all of these three cases, cultures of the pus showed a pure streptococcus infection.

In two of the thirty-six cases damage was done to the rectal wall at the time of operation.

In Case 2 of the series, the anterior wall of the rectum and the sphincter was torn; this was repaired at once and healed *per primam.*

The other case, operated upon by an assistant, showed at the end of the first week a small fistula (perineo-rectal) which was not healed, as patient declined operation.

In two cases (Nos. 10 and 32) operations were done for hemorrhoids which had developed during their illness, and this prolonged their stay in the hospital.

In one case (No. 11), (assistant's), there was a profuse discharge of pus from the perineal wound which delayed union forty-one days.

In two cases (Nos. 14 and 15) the seminal vesicle was found to be diseased. In one (No. 14) the vesicle was opened and drained. In the other (No. 15) both vesicles were removed.

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The time spent in hospital by some of the patients might seem long, but this was necessary because I desired to keep these patients under observation, as many of them could not otherwise have been traced.

As to the results of this operation on the sexual function, this is a more important question than in cases of prostatectomy in older men with enlarged prostates. We have been able to examine most of our patients and we have found that in no case has there been a complaint in regard to the character of the erection or the ability to have sexual intercourse. The sensation is not impaired but a discharge of seminal fluid at the time of the orgasm is entirely absent.

I do not think that the necessity for prostatectomy in prostatic abscess can always be determined before opening the urethra through the perineum. The indications for an operation, whether perineal section and drainage or prostatectomy, are very definite, but it is only by examination of the prostate by the finger passed into the prostatic urethra through a perineal opening that the necessity for prostatectomy can be positively known.

There is no absolute rule to guide the surgeon. The condition found at the time of operation must determine the extent of the operation, just as it does in all surgical procedures.

I have not abandoned altogether perineal section and drainage. I still consider this a good method, but the question is, whether prostatectomy is not a better method in the majority of cases.

I wish to express my thanks to Dr. Victor C. Thorne, assistant attending surgeon at Bellevue Hospital, for valuable assistance in collecting the clinical facts which form the basis of this paper.

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